Rhodora

JOURNAL OF THE

NEW ENGLAND BOTANICAL CLUB

Conducted and published for the Club, by

BENJAMIN LINCOLN ROBINSON, Editor-in-Chief.

MERRITT LYNDON FERNALD
HOLLIS WEBSTER } Associate Editors.

WILLIAM PENN RICH
EDWARD LOTHROP RAND } Publication Committee.

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Vol. 23. January, 1921 No. 265.

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"VERONICA" IN NORTH AND SOUTH AMERICA.

Francis W. Pennell

This study is the outgrowth of several attempts to revise our knowledge of the species of "Veronica" growing in different portions of the Western Hemisphere. Whether in our own "Local Flora," in the Rocky Mountain or the Southeastern States, or in Colombia and Ecuador, certain wide-ranging species were encountered, and the effort to verify the nomenclature in many instances took the reviewer into problems of the identity of Old World allies. On these accounts it has seemed best to consider in one study the plants of this group in both North and South America, and also to include known naturalized species.

Of all the tribes of the Scrophulariaceae mentioned by von Wettstein in his great revision of the family in "Die Natürlichen Pflanzenfamilien," that of the Digitaleae, to which *Veronica* is assigned, probably has least coherence. The plants at least should agree in having the antero-lateral lobes of the corolla external in aestivation and in not being parasites. I know of no offenders against the latter criterion. But, because they possess not only posterior corolla-lobes external but also form characteristic glands on the fruit or in the leaves, I have recently transferred the two lowland Tropical genera *Capraria* and *Scoparia* to the essentially Tropical tribe Gratioleae. This restricts the Digitaleae to a more likely distribution through the Temperate or Arctic zones and the cooler zones of Tropical mountains. I can not further analyze the tribe here, except to say that *Digitalis* itself, through possessing styles distinct at apex and a

septicidally dehiscent capsule, has seemed so remote from the plants which we are now considering that I have preferred to call these Veroniceae.

By a close comparison of species and genera, laying emphasis upon those characteristics which occur in correlation, the taxonomist can go far toward giving us a dynamic view of the races of life on the earth today. In this paper I shall try to group the species in accord with what I believe has been a real evolutionary advance, but it must be realized that few groups hold only old features unmodified, while few contain wholly new ones, although fortunately new characters do tend to appear in correlation. A growing knowledge of what are generalized structures in the Scrophulariaceae makes me believe this reconstruction safe. Fuller discussion of the phylogeny of this family is reserved for a later paper.

Within the small limits of "Veronica," as may be seen from the keys below, we have certain more or less fundamental changes. A septicidal dehiscence of the capsule, splitting along the line of carpel-union, is certainly primitive for the family. As might be expected in a group so highly modified as "Veronica" (its complexity is shown by the union of the posterior corolla-lobes, reduction of stamens to two, the united stigmas, etc.), we fail to find this method of capsule-dehiscence, but we do find two types which seem to have been derived independently from it. In the New Zealand and Patagonian plants which were originally described as *Hebe*, the carpels part, thus splitting sagittally the septum, after which a distal median suture through the septal wall of each carpel permits the seeds to escape. These plants are shrubs or even trees, and bear their flowers in specialized axillary racemes, a feature the significance of which will soon be discussed. Moreover *Hebe* has an exceedingly baffling tendency to form local races, a habit at contrast with that of the other "Veronicas." The austral distribution, with its suggestion of genetic remoteness, emphasizes *Hebe's* claim to recognition as a genus.

In the other genera septicidal dehiscence has been lost, or persists but as a tardy secondary rupture of the outer capsule-wall and one which never parts the septum. It is most pronounced in the relatively primitive genus *Veronicastrum*, called until recently *Leptandra*. Here, as is normal in Scrophulariaceae and is the case in *Hebe*, the capsule is longer than wide, and is turgid. The original seed of the

family (as seen in most Gratioleae and Buchnereae) was certainly covered with a simple reticulate testa, but among the "Veronicas" this stage survives only in *Veronicastrum* and the European *Paederota*, while *Hebe* has a flattened smooth "Veronica"-like seed. *Veronicastrum* is most readily distinguished by its well-developed corolla-tube—a feature which comparison with the evolution of other genera (such as *Afzelia* in the Buchnereae) makes me hold as primitive. I believe that here, as in that genus, the open corolla is a phylogenetically recent development. The distribution of *Veronicastrum* in eastern Asia and eastern North America, accords with that of many another ancient race. Yet that it is not directly ancestral to the other living groups is shown by its surprising peculiarity of bearing its leaves in whorls.

After thus excluding *Hebe* and *Veronicastrum*, our restricted group of species has much more coherence. To it I apply the genus-name *Veronica*. Very pronounced is the tendency to a drawing-out of each carpel so as to produce a capsule flattened contrary to the septum, while loculicidal dehiscence has become universal. The capsule tends to become short and bi-lobed. The seeds are flattened and show no trace of reticulation. The corolla-lobes mostly equal or exceed the tube. Progress has reached different apices of evolution in the subgenera to be called *Veronicella* and *Euveronica*.

In *Veronicella* the stem as well as the branches terminates in an indefinite racemose inflorescence, and in this it accords with nearly all of its tribe and with all primitive types of Scrophulariaceae. The flowers may be crowded together, even simulating the close inflorescence of *Veronicastrum*, or may be remote and so what we call "axillary." Along with this generalized inflorescence we find much diversity of other features. The capsule shows a series of stages from relatively turgid and unnotched to strongly flattened or deeply notched. Associated with the former state, the posterior sepal may be present as smaller or rudimentary, while with the latter it is wholly lost. The leaves, primitively opposite throughout Scrophulariaceae, are always alternate through the inflorescence in *Veronicella* and there is an increasing tendency for nearly all of them to be alternate. From a comparison of various widely scattered genera, it seems probable that in this family annuals have always been developed from perennial ancestry. It is quite in accord with this to find in *Veronicella* that the fifth sepal, unnotched capsule and opposite

leaves occur in the perennial species, while the extreme stages of capsule-lobing and flattening, of few and large seeds, and of alternate leaves are in the relatively few annual sorts. Also, as is the general habit in allied genera, the original *Veronicellas* were surely erect herbs.

In *Euveronica* the stem continues indefinitely as a vegetative axis, its leaves opposite throughout, while the inflorescence is localized in specialized axillary racemes. This is the inflorescence of *Hebe*, but the diversity of capsule-structure tells us that such localization must have originated independently in these two groups. Elsewhere in this tribe I know it only in the Chinese *Botryopleuron* Hemsley, which seems to be separated by little else from *Calorhabdos* Bentham. The flowers in the racemes of *Euveronica* are alternate as they are in all inflorescences of *Veronicella*. This accords with the view that these racemes are reduced branches, and not formed by the forking of originally simple pedicels. No stages suggesting the latter alternative are known to exist, and the fact that remote axillary flowers occur in *Veronicella* only in some profoundly modified annual species makes such a derivation very improbable. The species of *Euveronica* are all perennial, and such an erect-growing species as *V. latifolia*, which has a scarcely notched capsule, shows a close approximation in habit to the most primitive group of *Veronicella*, including species such as *V. maritima* and *V. mexicana*.

A few words need be said concerning age and distribution of various species. Contrary to expectation and certain widely advanced theories, it is not those species whose structures proclaim them as most ancient which are necessarily most widely dispersed. Structurally none of our species can make better claim to antiquity than *Veronica mexicana*, yet this species occurs only in a limited area in the mountains of northern Mexico. Obviously it has no close kindred in our flora, and so must, I believe, be considered a relict. Again, *V. Copelandii*, our only other species definitely retaining the posterior sepal, is known from but a few mountains in California. On the other hand, the group of *Veronica alpina* and *V. Wormskjoldii* has a wide range through Temperate North America and Eurasia, although it has become divided geographically into several well-marked species. But it is the obviously non-primitive species which have prospered most and have become or are becoming very widespread. These possess peculiar skill in taking advantage of natural,

or recently of man-made, methods of dispersal. Of species naturally distributed, *Veronica serpyllifolia humifusa* and *V. Anagallis-aquatica* have become nearly cosmopolitan within their respective climates and environments, while carried by human agency and today aggressive weeds in our land are *Veronica serpyllifolia*, *V. peregrina* and its variety *xalapensis*, *V. arvensis*, *V. persica*, and *V. officinalis*. To this list, otherwise of Palaearctic origin, America has contributed *Veronica peregrina*, thus showing that the New World may develop sufficiently aggressive plants.

I must thank the curators of the United States National Museum, New York Botanical Garden and Philadelphia Academy of Natural Sciences who have placed their rich collections at my disposal. Also I have seen specimens of certain species from the Gray Herbarium. Probably nearly 4000 sheets have been examined in the present study. It has been with hesitation but I trust to the clearing of the problems involved, that I have ventured so freely into Eurasian botany.

Key to Genera and Subgenera.

Capsule dehiscing loculicidally, its walls and septum thin. Herbs, the stem dying with the leaves.
  Corolla white or pinkish, its lobes much shorter than the tube. Capsule acute, longer than wide, not flattened, dehiscing by short apical slits. Seeds slightly reticulate. Plant 10–20 dm. tall, with leaves in whorls of four or five. Main stem terminating in an inflorescence... I. Veronicastrum
  Corolla blue or white, its lobes nearly as long as or usually longer than the tube. Capsule acutish to deeply notched, as broad as or broader than long, more or less flattened contrary to the septum, dehiscing by longer slits which extend at times even to the base. Seeds not reticulate. Plants lower, with leaves, at least the lowermost, opposite, or very rarely in whorls of three or four..... II. Veronica
    Main stem terminating in an inflorescence, its flowers remote and axillary or densely crowded, in all cases the upper bract-leaves alternate..... Subgenus 1. *Veronicella*
    Main stem never terminating in an inflorescence, the leaves opposite throughout and the flowers all in axillary racemes..... Subgenus 2. *Euveronica*
Capsule dehiscing septicidally, the thick septum splitting and each carpel opening distally by a median slit through the septal wall. Leaves opposite throughout, and flowers all in axillary racemes. Shrubs or small trees, the coriaceous leaves in falling leaving conspicuous scars..... III. Hebe

I. **VERONICASTRUM** [Heister] Fabr.

Veronicastrum [Heister] Fabr., Enum. Meth. Pl. Hort. Helmstad. 111. 1759. (Checked only in second edition, 205. 1763.) Type species, *Veronica virginica* L.

1. **Veronicastrum virginicum** (L.) Farwell.

Veronica virginica L., Sp. Pl. 9. 1753. "Habitat in Virginia." Plant grown in the Clifford Garden in Holland, and carefully described by Linné, Hort. Cliff. 7. 1737. No pubescence on leaf mentioned.

Veronicastrum album Moench, Meth. Pl. Hort. Marburg. 437. 1794. " . . . . . *Veronica virginica* Linn." Grown in the Marburg Garden, Germany.

Calistachya alba Raf. in Med. Repos. New York. II. **5**: 352. 1808. Based on *Veronica virginica* L. Type species of *Calistachya* Raf., not *Callistachys* Vent., 1804.

Veronica quinquefolia Stokes, Bot. Mat. Med. **1**: 28. 1812. "In a garden . . . . . *V. virginica* L." Evidently name chosen as more appropriate than "virginica." Two varieties, or actually forms, *alba* and *incarnata*, are listed.

Leptandra virginica (L.) Nutt., Gen. N. Am. Pl. **1**: 7. 1818. Type species of *Leptandra* Nutt.

Eustachya alba Raf., Cat. Ky. 14. 1824. Based upon *Veronica virginica* L. *Eustachya* Raf. in Am. Mo. Mag. **4**: 190. 1819, was a new name for *Calistachya* Raf. Name antedated by *Eustachys* Desv., 1810.

Leptandra virginica purpurea Eaton, Man. Bot. ed. V. 275. 1829. " ——— " Described as with "flowers purple." Credited to Pursh, who however assigned his color variety no name. According to Pursh, Fl. Am. Sept. 10. 1814: "On the mountains of Virginia I observed a . . . . variety with purple flowers."

Leptandra purpurea Raf., Med. Fl. **2**: 20. 1830. "Confined to the savannas of the South and the West [of the United States]." Carefully described; a purplish-flowered, single-spiked plant with sessile leaves in whorls of three. Three varieties, or actually forms, named.

Leptandra alba Raf., l. c. 21. 1830. "The most common species, being found all over the United States." Described with white flowers and semi-petiolate leaves in whorls of usually five. Several varieties, or actually forms, named.

Leptandra villosa Raf., l. c. 21. 1830. "Mr. Schriveinitz [Schweinitz] has found it in North Carolina." Careful description of the form with leaf-blades pubescent beneath. This may be considered a forma **villosa** (Raf.) Pennell, comb. nov.

Eustachya oppositifolia Raf., New Fl. Am. **2**: 21. 1837. "Mts. Apalaches of Virginia." Apparently an opposite-leaved *virginica*, a form which I have never seen.

Calistachya virginica lanceolata Farwell in Mich. Acad. Sci. Rep. **17**: 176. 1915. "Farwell No. 1165, July 18, 1891, from Ypsilanti [Michigan]." A narrow-leaved form.

Veronicastrum virginicum (L.) Farwell, Drugg. Circ. **61**: 231. 1917.

Meadows and open woods, from Vermont, southern Ontario and Minnesota to Georgia and eastern Texas. Southward forma *villosa* is more prevalent.

Variable, but certainly one species. Varying in number of leaves in whorl (five, four, rarely three, or in *oppositifolia* even two), in leaf-form from lanceolate to nearly ovate, pubescent or nearly or quite glabrous below (forma *villosa* with whole under surface velvety), in inflorescence being of one or several racemes, and in color of corolla and filaments, varying from white through pinkish to lighter shades of violet-purple.

II. **VERONICA** L., Subgenus 1. VERONICELLA (Fabr.)

Veronicella [Heister] Fabr., Enum. Meth. Pl. Hort. Helmstad. ed. II. 205. 1765. Type species, *Veronica hederaefolia* L., of Europe.

A. Perennials, from subterranean stems (rootstocks). Only the upper leaf-axils flower-bearing, so that inflorescence is formed of definite racemes.

B. Capsules only slightly flattened, even the lowermost on pedicels shorter than the capsule-length: inflorescence appearing a spike. Style two or three times the length of the capsule. Leaf-blades lanceolate. Plants 4–10 dm. tall.

Petals broadly oblong. Leaves opposite or in threes, rarely in fours, 3–15 cm. long, the blades acute to acuminate, dentate-serrate to sharply and somewhat doubly serrate. Plant 4–10 dm. tall ..... 1. *V. maritima.*

Petals oblong-lanceolate. Leaves always opposite, 3–6 cm. long, the blades acutish, crenate or crenately serrate. Plant 2–4 dm. tall ..... 2. *V. spicata.*

B′. Capsules strongly flattened, the lowermost on pedicels nearly or quite as long as the capsule-length; inflorescence obviously a raceme. Style slightly, if at all, longer than the capsule.

C. Capsule as long as or longer than wide, less deeply or not notched. Corolla violet-blue, rarely nearly white, glabrous within. Leaf-blades obtuse, acutish to acuminate. Stems erect, nearly or quite from the base.

Calyx 5-parted, the posterior lobe over half the length of the others. Leaf-blades lanceolate, acuminate, irregularly dentate. Plants 5–6 dm. tall ..... 3. *V. mexicana.*

Calyx 4-parted, or with a rudiment of the fifth lobe. Leaf-blades ovate to oblanceolate, obtuse to acutish, entire to serrate. Plants less than 3 dm. tall.

Style longer than the capsule. Filaments equaling or exceeding the corolla. Calyx-lobes unequal, the anterior longer. Leaf-blades entire.

Leaf-blades oblong-elliptic, hirsute-pubescent, acute. Sepals five, the posterior much the smallest, the others slightly unequal. Capsule scarcely notched. Corolla 5 mm. long.....4. *V. Copelandii.*

Leaf-blades elliptic-oval, glabrous or glabrate, obtuse to acutish. Sepals four, decidedly unequal. Capsule strongly notched. Corolla 5–7 mm. long.....5. *V. Cusickii.*

Style shorter than or nearly as long as the capsule. Filaments shorter than the corolla. Calyx-lobes of uniform length. Leaf-blades, at least the lower, crenate to serrate.

Capsule rounded or acutish, not notched. Style nearly as long as the capsule. Sepals canescent, not ciliate, nearly equaling the capsule. Corolla twice as long as the sepals. Stem-leaves elliptic-oblanceolate. Plant 1 dm. tall or less, the inflorescence minutely pubescent.....6. *V. fruticans.*

Capsule slightly notched. Style less than half the length of the capsule. Sepals conspicuously ciliate, one-half to two-thirds the length of the capsule. Corolla less than twice as long as the sepals. Stem-leaves elliptic to ovate. Plants mostly 1–3 dm. tall, the inflorescence hirsute-pubescent.

Capsule glabrous. Sepals glabrous on back, ciliate on margins with non-glandular hairs. Plant usually 1–2 dm. tall.....7. *V. alpina.*

Capsule pubescent. Sepals usually pilose on back as well as margins.

Leaf-blades serrate, the largest nearly cordate at base. Capsule and sepals with hairs which have attenuate non-glandular tips, the sepals less pilose or glabrous on back. Plant usually 1–1.5 dm. tall, with pedicels becoming 8–11 mm. long.....8. *V. Stelleri.*

Leaf-blades crenate-serrate to nearly entire, rounded at base. Capsule and sepals with hairs which have rounded glandular tips, the sepals densely pilose on back. Plant usually 1.5–3 dm. tall, with pedicels 2–5(–10) mm. long.

Corolla mostly 6–7 mm. long. Pedicels mostly 5–10 mm. long. Leaf-blades mostly ovate, frequently serrate....9a. *V. Wormskjoldii nutans.*

Corolla mostly 4–6 mm. long. Pedicels mostly 2–5 mm. long. Leaf-blades mostly oblong-ovate, rarely evidently serrate..9. *V. Wormskjoldii*.

C′. Capsule obviously wider than long, notched one-fourth length. Corolla white or bluish, with deep-blue lines on the posterior side, the tube pubescent within. Style nearly as long as the capsule. Leaf-blades ovate-oblong or oval, obtuse, obscurely crenate. Stems extensively repent, ascending at apex.

Stem throughout and pedicels minutely pubescent with upcurved hairs. Corolla about 2 mm. long, white or whitish, with blue lines on posterior side. Capsule mostly 3–4 mm. wide.....10. *V. serpyllifolia*.

Stem distally and pedicels finely pubescent with longer mostly spreading hairs. Larger throughout, the corolla mostly about 3 mm. long, pale-bluish with deeper blue lines on posterior side. Capsule mostly 4–5 mm. wide.....10a. *V. serpyllifolia humifusa*.

A′. Annuals, fibrous-rooted, but without subterranean stems. Most leaf-axils flower-bearing, so that inflorescence appears to be of "axillary" flowers.

B. Pedicels shorter than the lanceolate to linear sepals. Capsule strongly flattened. Seeds many, less than 1 mm. long, flat, smooth or nearly so. Plants erect.

Leaf-blades, excepting the lowermost, sessile, those of the lower stem-leaves oblanceolate, nearly entire to dentate. Corolla whitish throughout. Capsule greenish, notched, the minute style hidden between the capsule-lobes. Plant glabrous or with minute usually gland-tipped hairs.

Plant glabrous.....11. *V. peregrina*.

Plant pubescent with short gland-tipped hairs, which are usually present even on the capsule.....11a. *V. peregrina xalapensis*.

Leaf-blades petioled, or the upper nearly sessile, those of the lower stem-leaves ovate, crenate-serrate. Corolla deep violet-blue. Capsule yellowish-brown, pubescent with slightly gland-tipped hairs, strongly flattened, notched nearly or about one-third length, the longer style reaching about to the capsule-lobes. Plant pubescent with white glandless or obscurely gland-tipped hairs.....12. *V. arvensis*.

B′. Pedicels longer than the ovate sepals. Capsule relatively turgid. Seeds few, 1.3–3 mm. long, convex-arched, roughened. Plants repent.

Leaf-blades ovate, serrate to dentate. Sepals shortly ciliate. Capsule slightly flattened, deeply notched, pubescent. Seeds 1.3–1.5 mm. long, brown.

Capsule-lobes united at least two-thirds their length. Leaf-blades dentate, truncate or cordate at base. Stem finely pubescent with glandless hairs.

Petals not exceeding the ovate sepals. Capsule-lobes rounded, the most distal point of each about midway between the style and the lateral margin. Style shorter than the capsule.

Leaf-blades oblong-ovate, crenate-serrate. Capsule 4–5 mm. wide, with a narrow notch about one-third depth of capsule; the stout style (less than 1 mm. long) about equaling the capsule-lobes.....13. *V. agrestis.*

Leaf-blades ovate, dentate with rounded teeth. Capsule 4 mm. wide, less deeply and narrowly notched; the slender style (1–1.5 mm. long) surpassing the capsule-lobes.....14. *V. polita.*

Petals much exceeding the narrowly ovate sepals. Capsule-lobes acutish in profile, the most distal point of each near the lateral margin. Style as long as the capsule.....15. *V. persica.*

Capsule-lobes united only at base. Leaf-blades serrate, narrowed at base. Stem pubescent with gland-tipped hairs.....16. *V. biloba.*

Leaf-blades broadly and shallowly cordate, 3–5-lobed, the lobes rounded and entire. Sepals broadly ovate, conspicuously ciliate. Capsule turgid, scarcely notched at apex, glabrous. Seeds 2.5–3 mm. long, blackish..17. *V. hederaefolia.*

1. VERONICA MARITIMA L.

Veronica maritima L., Sp. Pl. 10. 1753. "Habitat in maritimis Europae macris apricis." According to Linné, Fl. Lapp. 5. 1737: "Ad fines Alpium Lapponicarum iuxta mare septentrionale saepius conspicitur, in toto itinere nullibi coposior visa est, quam in maritimis Tornoensibus." Type carefully described by Sir. J. E. Smith, and specimen from Tornea, collected by C. P. Laestadius, seen in Herb. New York Botanical Garden. This is a form with long-acuminate, sharply serrate leaves.

Veronica longifolia L., l. c. 10. 1753. "Habitat in Tataria, Austria, Svecia." Diagnosis quoted from Linné, Hort. Ups. 7. 1748, where this plant is more fully described and is cited: "Habitat in Tataria." Sir J. E. Smith, in Rees Cyclop. **37**: Art. Veronica, no. 10, 1819, discussing the specimens in the Linnean Herbarium, carefully contrasts these two Linnean species. *V. longifolia* he distinguishes by its leaves less deeply and doubly serrate, on shorter petioles, and calyx shorter (not longer) than the tube of the corolla, its lobes broad, ovate and nearly equal (not unequal and narrow). All which contrasts certain plants; however each character varies, and it seems difficult or impossible to distinguish these as species.

Roadsides and waste land, from the Magdalen Islands and Prince Edward Island to Quebec, Connecticut and central New York. Introduced from northern Eurasia.

What is here termed *Veronica maritima* presents remarkable variability, and whether it constitutes one polymorphic species, one species with varieties, or a group of closely related species, must be decided by field-study in the lands in which it is native. Until Old World students arrive at a much more definite consensus of opinion, there seems to be slight profit in our attempting further analysis and identification of the large number of named variants of this group. But to show the range of variation seen in American material I present this doubtless artificial outline of forms:

Corolla (of at least largest flowers) 5.5–7 mm. long. Filaments much exceeding the corolla. Leaves opposite or in threes, 6–15 cm. long, long-acuminate, sharply serrate.
  Leaf-blades beneath pubescent over most of surface. The most prevalent form northward, Magdalen Islands and Nova Scotia to Massachusetts and northern New York..... *Forma A*
  Leaf-blades beneath glabrous or slightly pubescent on veins. In Nova Scotia and Massachusetts. Evidently a mere variant of Forma A..... *Forma B*
Corolla 4–5.5 mm. long.
  Leaf-blades beneath pubescent over entire surface and usually also above. Filaments nearly twice as long as the corolla.
    Leaves in threes or fours, 8–10 cm. long, the blades linear-lanceolate, long-acuminate, sharply serrate. Buckfield and Cliff Island, Maine. Probably the typical *V. maritima* L. As in Forma A, but smaller-flowered..... *Forma C*
    Leaves opposite, 3–5 cm. long, the blades oblong-lanceolate, acute, dentate-serrate. In Quebec, Massachusetts, and central New York..... *Forma D*
  Leaf-blades beneath glabrous, or slightly pubescent on the veins, lanceolate, or oblong-lanceolate.
    Leaves opposite, or very rarely in threes, 3–10 cm. long, the blades acuminate or acute, dentate-serrate or somewhat sharply serrate. Filaments usually only slightly longer than the corolla. The most prevalent form southward, and possibly a distinct species. On Prince Edward Island; from Maine to Vermont and Connecticut; in Martinique..... *Forma E*
    Leaves opposite, 5–8 cm. long, the blades obtuse or acutish, crenate-serrate. Filaments much exceeding the corolla. An anomalous form, perhaps a hybrid containing some *Veronica spicata* ancestry. Elmira, New York..... *Forma F*

Perhaps even the little-understood *Veronica spuria* L. is to be included in this aggregate species. If so, as this name has precedence of position, according to the American Code[1] it must be adopted. *Veronica spuria* L., Sp. Pl. 10. 1753 ("Habitat in Europa australiore,

[1] Priority of position within a work, or as in this case on a single page, affords an unfortunate rule to follow, because it does not indicate any time-precedence in the author's mind. Perhaps a better principle would be to select, among 'species' actually seen by the author, that earliest known by him. In the case above, Linné knew *Veronica spuria* and *longifolia* from 1748, but *V. maritima* from 1737.

Sibiria"), is really adopted from Linné's Hortus Upsalensis, where the plant is more fully described, contrasted with *V. maritima*, and stated to be from Sibiria. A plant with stems and under surface of leaves glabrous, the latter with acute (not acuminate) serratures, from Siberia, would appear to be the same as certain specimens seen in Herb. New York Botanical Garden from Altai and Manchuria. These all have very short petioles, a feature especially stressed by Sir J. E. Smith in his re-description of the Linnean plant, and so appear to be in contrast with any form seen of *V. maritima* L. It will be noticed that this interpretation of *Veronica spuria* L., is not that of Ledebour, Fl. Ross. **3**: 231. 1846, and others, who hold the name for a plant with leaves narrowed at base.

2. VERONICA SPICATA L.

Veronica spicata L., Sp. Pl. 10. 1753. "Habitat in Europae borealis campis." A specimen was in the Linnean Herbarium in 1753, and the plant is included in Flora Suecica from Sweden. Several specimens from Sweden seen in Herb. New York Botanical Garden.

Roadside, Stockholm, northern New York. Introduced from northern Eurasia.

3. **Veronica mexicana** S. Wats.

Veronica mexicana S. Wats. in Proc. Am. Acad. **23**: 281. 1888. "On cool damp bluffs of streams in the Sierra Madre, Chihuahua, C. G. Pringle (n. 1349), Sept., 1887." Isotype[2] seen in Herb. Columbia University at New York Botanical Garden.

Mountain slopes, at altitudes of 1950 to 2400 meters; Sierra Madre of southern Chihuahua and Durango.

4. **Veronica Copelandii** Eastw.

Veronica Copelandii Eastw. in Bot. Gaz. **41**: 288. *f. 2*. 1906. "Collected on Mount Eddy [California] at an elevation of 2500^{m} by Dr. Edwin Bingham Copeland, August 18, 1903, distribution of C. E. Baker, 1903, no. 3931." Isotype, collected on Mount Eddy, Siskiyou County, and distributed by C. F. Baker, seen in Herb. New York Botanical Garden.

Alpine slopes, known only from the mountains of Siskiyou, and perhaps adjoining counties in northern California.

5. **Veronica Cusickii** A. Gray

Veronica Cusickii A. Gray, Syn. Fl. N. Am. **2**[1]: 288. 1878. "Alpine region of the Blue Mountains, W. Oregon. W. C. Cusick."

[2] The word "Isotype" is used to designate a specimen of the original collection, other than the type itself. See Torreya **19**: 13. 1919.

Veronica Allenii Greenm. in Bot. Gaz. **25**: 263. 1898. "Collected by O. D. Allen along Paradise river on Mt. Rainier [Washington], altitude 1700^{m}, August 20, 1897, no. 95a." Isotype seen in Herb. New York Botanical Garden. Differs, as stated by Greenman, "in its smaller flowers, the white corolla, and less exserted stamens and style." As stated by Macbride and Payson, "typical *V. Cusickii* is common on Mt. Rainier," so that it seems probable that *Allenii* is better considered as an albino form, forma **Allenii** (Greenm.) Pennell, comb. nov. However the single collection known differs from *V. Cusickii* by the following contrast: corolla 3–4 mm. long, white (not 5–6 mm. long, blue), and sepals less unequal. The plant should be re-collected and studied.

Veronica Cusickii Allenii (Greenm.) Macbr. & Pays. in Contrib. Gray Herb. II. **49**: 67. 1917. I should not consider an albino state, occurring with its species, as of rank higher than forma.

Mountain slopes, Cascade and Olympic mountains of Washington eastward to Coeur d'Alene Mountains of northern Idaho and Blue Mountains of northeastern Oregon.

6. **Veronica fruticans** Jacq.

Veronica fruticans Jacq., Enum. Stirp. Vind. 2,200. 1762. "Crescit copiose in herbidis saxosisque montium Schneeberg, Schneealbl, Gans. &c. [Austria]." Description of calyx as covered with a very light pubescence, of the corolla as larger than *V. alpina* (by which name *V. pumila* Allioni is intended) and more blue, indicate that this name belongs to the plant now discussed rather than to *V. fruticulosa* L. The Greenland plant has been known by the later name *Veronica saxatilis* Scop.

East Greenland (Lange), and on Disco Island, West Greenland. Through the mountains of western Eurasia, Scandinavia, Scottish Highlands and Alps.

Veronica fruticulosa L., Sp. Pl. ed. II. 15. 1762. ("Habitat in Alpibus Austriae, Helvetiae, Pyrenaeis".) From Linné's brief description, the description and plate of Haller cited (Stirp. Helv. **1**: 532. *pl. 9.* 1742), the south European range assigned, and the identification by Sir. J. E. Smith (in Rees Cyclop. **37**: Art. Veronica, no. 20) who had Linné's specimen before him, this name must be held for the pink-flowered, larger, slightly glandular-pubescent, longer- and at times dentate-leaved plant of the Alps and Pyrenees. Linné's description of the calyx as glabrous is apparently inaccurate, as this is somewhat glandular-pubescent. Scopoli, in his Flora Carniolae, ed. II. **1**: 11 and 19. 1772, well contrasts *Veronica fruticulosa* and *V. fruticans*, although describing both as new species from Carniola.

The former, his *V. frutescens*, is a plant of lower and subalpine stations, while the latter, his *V. saxatilis*, is truly alpine. For contrasting illustrations see Reichenbach, Ic. Fl. Germ. et Helv. **20**: *pl. 1717*. 1862.

7. **Veronica alpina** L.

Veronica alpina L., Sp. Pl. 11. 1753. "Habitat in alpibus Europae." Based primarily upon the plant described in Linné, Fl. Suec. 5. no. 13. 1745, where the locality is stated: "Habitat in Alpibus Lapponicis monte Wallewari." This in turn is based upon Linné, Fl. Lapp. 7. no. 7. *pl. 9. f. 4.* 1737, where Linné's own Lapland plant is well described and illustrated. Obviously the name must be given to the species of northern Europe now considered, Linné using the term "alps" as applicable to any high mountain.

Veronica alpina corymbosa Hornem., Fl. Dan. fasc. **33**: 3. *pl. 1921.* 1829. "Auf der Insel Disco in Groenland. Gefunden von Capitain-Lieutenant Holbøll." Figured as with an abbreviated, but obviously young raceme. Specimen from Disco Island seen in Herb. New York Botanical Garden.

Open slopes, East Greenland. Also in Scandinavia, and the Highlands of Scotland.

Under this name have long been included two species which may be distinguished as follows:

Capsule glabrous. Sepals glabrous on back, ciliate on margins, apparently but little shorter than the corolla. Plant usually 1–2 dm. tall, usually little branched at base ..... *V. alpina*

Capsule pubescent with glandless hairs. Sepals pilose on back as well as margins, much shorter than the corolla. Plant usually .5–1 dm. tall, usually much branched at base..... *V. pumila*

VERONICA PUMILA Allioni, Fl. Pedem. **1**: 75. *pl. 22. f. 5.* 1785 ("In saxosis summae alpis Albergian dictae"), is stated by Allioni to differ from "Veronica alpina" of the Italian Alps, in its leaves 'not crenate, but dentate, rugose and more acute.' Individual variants of the South European "alpina" answer this characterization, and Bertolini, in his Flora Italica **1**: 89. 1833, assures us that he has obtained specimens proving this to be but a state. Frequently the leaves of variants are dentate and more acute.

This is the species known as "Veronica alpina" through southern Europe, the Pyrenees, Cevennes, and Alps, and as var. *lasiocarpa* in northern Europe, Scandinavia, and the Highlands of Scotland. Wahlenberg, in his Fl. Carpat. Princip. 5. 1814, called this *Veronica alpina australis*, and the true "alpina" *V. alpina lapponica.*

8. **Veronica Stelleri** Willd.

Veronica Stelleri Willd.; Link, Jahrb. **1**[3]: 40. 1820. "In Herbar. [Willdenow bei Berlin] aus Kamtschatka von Pallas gesandt." Accord-

ing to Chamisso and Schlechtendahl, in Linnaea **2**: 557. 1827: "*Veronica Stelleri* Pallas in Herb. Willd. n. 192. . . . . quam e Camtschatca et e Curilis Pallas habuit, in Unalaschka insula Aleutorum legimus frequentem." By them very fully described, and contrasted with their *V. alpina unalaschkensis*. Specimen from "Mts. of Unalaska, 2000 ft.," collected by A. Kellogg no. 295, seen in United States National Herbarium.

On the Aleutian and Pribiloff Islands, Alaska.

9. **Veronica Wormskjoldii** Roem. & Schult.

Veronica Wormskjoldii R. & S., Syst. **1**: 101. 1817. "*V. villosa* Wormskjold . . . . In Grönlandia." Evidently the species now considered.

Veronica alpina unalaschkensis C. & S. in Linnaea **2**: 556. 1827. "Legimus [Chamisso et Eschscholtz] in montosis insulae Unalaschka Aleutorum." Collections from Unalaska made by C. F. Baker 4988, W. L. Jepson 86, 135, C. H. Merriam in 1891, and C. V. Piper 4527, seen.

Veronica alpina Wormskjoldii (R. & S.) Hook. in Bot. Mag. **57**: *pl. 2975*. 1830.

Veronica mollis Raf., New Fl. Am. **4**: 38. 1838. "From Origon, seen alive in gardens." Apparently this species is intended, but the flowers are described as "pale blue" and "large."

Veronica alpina villosa (Wormskj.) Lange, Consp. Fl. Groenl. 261. 1887. "(*V. villosa* Wormskj. mscr.) . . . . V. Gr. [West Greenland]: Avangnardlek 62° 25′ (Holst.)."

Moist, grassy ledges and meadows, West Greenland, northern Labrador, Gaspé County, Quebec, Hudson Bay, and Alaska, southward, in the east on Mt. Katahdin, Maine,[3] and the White Mountains, New Hampshire, in the west through the Rocky Mountains to northern New Mexico, the San Francisco Mountains of Arizona and the Ruby Mountains of Nevada, and through the Cascade Mountains and Sierra Nevada to California.

There appears to be a tendency for plants of the Pacific ranges from Alaska to California to have styles slightly longer, usually ¼ to ⅓ the length of the capsule, rather than ⅙ to ¼. Northward is the following more pronounced variant.

9a. **Veronica Wormskjoldii nutans** (Bong.) Pennell, comb. nov.

Veronica nutans Bong. in Mém. Acad. Petersb. **2**: 157. 1833. "Dr. Mertens a . . . cueillies a l'île de Sitcha." An old specimen in Herb. Columbia University labeled simply "Veronica nutans Bong. Sitcha," may be an isotype.

[3] Reported by Fernald, in Rhodora **3**: 176. 1901 (as *V. alpina* L.).

Along the Alaskan coast from Sitka to Kodiak Island, while northward and on the mountains inland typical *Wormskjoldii* occurs.

10. VERONICA SERPYLLIFOLIA L.

Veronica serpyllifolia L., Sp. Pl. 12. 1753. "Habitat in Europa & America septentrionali ad vias, agros." Specimen in the Linnean Herbarium, and plant cited in the Flora Suecica as occurring "in pascuis sterilioribus riguis frequens," are evidently of the species now considered.

Meadows, barrens and open woodland, from Newfoundland and Ontario to Minnesota, South Carolina and Missouri, mostly common; British Columbia; Costa Rica; Jamaica; Venezuela. Introduced from western Eurasia, or perhaps also native, in which case our plant, which is not montane, would appear to have been independently derived from the wide-spread mountain variety, *humifusa*.

10a. **Veronica serpyllifolia humifusa** (Dickson) Vahl.

Veronica humifusa Dickson in Trans. Linn. Soc. **2**: 288. 1794. "I found [it] upon very high mountains, and under wet shady rocks [Scotland. James Dickson in 1789]." Description not intended to apply to the variety now considered, but to a depressed form of it. Also is inaccurate (as stated by me in Torreya **19**: 166. 1919) in calling for a plant with leaves often in threes and fours, a condition which I have not observed within this species. However this must be a form of *serpyllifolia*, and this name has long been current in British floras for denoting an alpine more pubescent depressed variety of that species. Surely the depressed habit must prove ecologic, but, as understood long ago by Sir J. E. Smith (Fl. Brit. **1**: 19. 1800), there is a hirtous *V. serpyllifolia* in the upland, "in montosis." Four specimens in Herb. Columbia University, collected along streams in the Clava Mountains, Forfarshire, Scotland, show well this variety. The stems are but 5 cm. long, ascending or even erect at apex, and above are pubescent with spreading hairs. That the plants are but dwarves of this wide-spread variety is confirmed by their obviously large corollas. The plants are so dwarfed that, due to the crowding of the pairs, the leaves might seem whorled.[4] American plants from high altitudes become likewise dwarf and spreading.

Veronica neglecta F. W. Schmidt, Fl. Boem. **1**: 12. 1794. Description not seen, but in Roemer & Schultes, Syst. Veg. **1**: 102. 1817, we are informed that *neglecta* is "hirsuta, pilis brevibus confertis," while Koch, Syn. Fl. Germ. et Helv. 529. 1837, terms it a "forma maior, fol. ovatis." This combined description surely indicates our plant.

[4] Prof. Fernald has suggested that Dickson intended to describe his plant as bearing three or four pairs of leaves.

Veronica serpyllifolia humifusa (Dickson) Vahl, Enum. Pl. **1**: 65. 1805.

Veronica ruderalis Vahl, l. c. 66. 1805. "Habitat in ruderatis versuris et humidis locis frigidis Peruviae." Re-naming, with a re-arranged description, of the plant called by Ruiz and Pavon (Fl. Peruv. et Chil. **1**: 6. 1798) "Veronica serpillifolia" and obtained by them "in ruderatis, versuris et humidis locis frigidis Pillao [Peru]." Description distinctive of the variety now considered.

Veronica serpyllifolia neomexicana Cockerell in Am. Nat. **40**: 872. 1906. "I found it at the top of the Las Vegas Range in New Mexico, at 11,000 feet, June 28, 1902." Isotype seen in Herb. New York Botanical Garden.

Veronica funesta Macbr. & Pays. in Contrib. Gray Herb. II. **49**: 68. 1917. "Oregon: Swan Lake Valley, June 21, 1896, Elmer I. Applegate, no. 424 (Type, Gray Herb.)." Type, collected "along mountain streams," seen in Gray Herbarium. The filaments are obviously shorter than in *V. Cusickii* A. Gray, and the (immature) capsule is wider than long.

Alpine meadows, reaching sea-level northward, from Labrador to Alaska, south, eastward to northern Maine and Vermont, westward through all high ranges of Canada and the United States, at scattered stations in Mexico[5] (Popocatepetl and Ixtaccihuatl), and through the Andes from Colombia to Bolivia. Through the mountains of Eurasia, from Scandinavia, Scotland and the Pyrenees to the Himalayas. Very wide-ranging, and certainly the parent of the species, *V. serpyllifolia*.

In Eurasian botany this pubescent larger-flowered plant of mountains has repeatedly been distinguished from *Veronica serpyllifolia*, specifically, varietally, or as but a mountain-form of that species. Among names proposed for it are: *Veronica serpyllifolia pubescens* Spenner, Fl. Frib. 351. 1826, from Germany; *V. serpyllifolia borealis* Laestad. in Nov. Act. Soc. Ups. **11**: 211. 1839, from Sweden; *V. serpyllifolia major* Baumg., Enum. Stirp. Transsilv. **1**: 20. 1816, from Transsilvania; *V. serpyllifolia major* Schur., Enum. Pl. Transsilv. 500. 1866, also from Transsilvania (name apparently independently chosen; plant well-described); and *V. serpyllifolia alpina* Hook., Brit. Fl. 4. 1830, from Scotland. *Veronica fontana* Willd.; Link, Jahrb. **1**[3]: 41. 1820, is a name which has been used in Alaskan botany.

[5] To be expected on all high cordilleras of Mexico and Central America.

11. **Veronica peregrina** L.

Veronica peregrina L., Sp. Pl. 14. 1753. "Habitat in Europae hortis, arvisque." Diagnosis quoted from Linné, Fl. Suec. 6. no. 15. 1745, where we are told that the plant "habitat in cultis & terra nuda Upsaliae, rarissima apud nos hodie plana, olim forte copiosior evasura." A plant of 'cultivated fields and bare earth,' known from a single locality in Sweden, and there 'formerly abundant but now very rare,' would seem to have been an adventive. That this was Linné's opinion is shown by the specific name chosen, meaning "foreign."

Veronica caroliniana Walt., Fl. Carol. 61. 1788. Type doubtless from lower South Carolina. The radical leaves are described as subincised, cauline subserrate. Evidently this is a pronounced phase of the 'romana' type, discussed below, and it is well-interpreted by such a specimen as House 3179 from Clemson College, South Carolina.

Veronica carnulosa Lam., Ency. Meth., Illust. **1**: 47. 1791. "Ex Europa & America septentr. in arvis."

Moist soil, river-banks, gardens and cultivated fields, usually appearing as a weed; wide-spread through eastern North America from New Brunswick to Iowa, Florida and Texas; also seen from British Columbia, Alaska, New Mexico, Oregon, Bermuda and Jamaica. Westward passes into the yet more widely ranging variety *xalapensis*.

In the Species Plantarum, 1753, Linné twice described this species, once from plants known living to him, as *Veronica peregrina*, and once from a specimen from southern Europe in his herbarium as *V. romana*. *V. peregrina* was supposed to possess leaves lanceolate-linear and very entire, while *V. romana* had these oblong and subdentate. The leaves of this species vary from one state to the other, and on each individual the larger leaves tend to the "romana" type. As *romana* has priority of position on page 14 of the Species Plantarum, and its diagnosis is descriptive of a specimen in the Linnean Herbarium, a claim might be made that this name should be used for our plant. However the citations in the synonomy of *V. romana* all pertain to another species, later separated by Linné as *Veronica acinifolia* (Sp. Pl. ed. II. 19. 1762), and the specific name "romana" was adopted from "Veronica minima, clinopodii minoris, folio glabro, romana. Bocc. mus. 2. p. 29. t. 102." As the Linnean diagnosis would also include Boccone's plant, which was clearly illustrated in the latter's Museo di Piante Rare della . . . Italia . . . 19. *pl. 102.* 1697, I think we should hold *romana* for this species, placing *acinifolia* in its synonomy.

11a. **Veronica peregrina xalapensis** (H.B.K.) Pennell

Veronica xalapensis H.B.K., Nov. Gen. et Sp. **2**: 389. 1818. "Crescit in Regno Mexicano prope Xalapa (alt. 630 hex.) in nemoribus Liquidambaris Styracifluae [Humboldt & Bonpland]."

Veronica chillensis H. B. K., l. c. 390. 1818. "Crescit in cultis Regni Quitensis prope Chillo, alt. 1340 hex. [Humboldt & Bonpland]." Described as differing from *V. xalapensis* in having stem repent, leaves wider (oblong-spatulate instead of oblong), and calyx-lobes narrower (lanceolate instead of oblong), at length reflexed. All these are points of normal variation in this variety, excepting that the plant is never truly repent. In the full description the word "repentes" is followed by the truer statement "adscendentes."

Veronica peregrina xalapensis (H.B.K.) Pennell in Torreya **19**: 167. 1919.

Environment as in *Veronica peregrina*, with which over an extensive area transitional forms occur; wide-spread and usually common through western North and South America from Alaska and Yukon to Chile and Argentina, in the Tropical portions of its range found only on the upper Cordilleras; eastward, in the United States frequent nearly to the Mississippi River, and sporadically eastward, probably as an introduction, to New England; also, probably also introduced, in Brazil.

12. Veronica arvensis L.

Veronica arvensis L., Sp. Pl. 13. 1753. "Habitat in Europae arvis, cultis." Diagnosis quoted from Linné, Fl. Suec. 6. no. 16. 1745, where we are told that the plant occurs in Sweden "in agris ruderatis cultis frequens." Our American introduced plant agrees well with the description of this.

Gardens and fields, or in dry woods, on cliffs and talus slopes, mostly common from Newfoundland to Iowa, Georgia and Oklahoma; southern Alaska to Oregon; Bermuda; Jamaica; Argentina. Introduced from Eurasia.[6]

13. Veronica agrestis L.

Veronica agrestis L., Sp. Pl. 13. 1753. "Habitat in Europae cultis, arvis." Diagnosis quoted from Linné, Fl. Suec. 6. no. 17. 1745, where the plant is said to occur in Sweden "in agris, areis,

[6] This species frequently grows in such "native" environments that the question of its being indigenous to the Northeast has been raised. But its weed-like character, ensuring its early introduction, and the fact that its American range is not so great as would be expected of such a species if native, leads me to think it introduced. See also Fernald in Rhodora **2**: 137. 1900. In the case of this and *Veronica officinalis* L., below, the burden of proof is on those who would claim them indigenous to both hemispheres.

cultis." According to the statement of Fries, Novit. Fl. Suec. 65. 1819, the Linnean *agrestis* is identical with his own *V. versicolor*, being the only one of Fries' segregates common or previously known in Sweden. Two specimens from Sweden seen in Herb. New York Botanical Garden, one collected at Scania by N. H. Nilsson in 1881.

Roadsides and rocky places, Newfoundland to Quebec and New Brunswick; on ballast at New York City and Philadelphia; Bermuda. Introduced from central and northern Europe.

14. VERONICA POLITA Fries

Veronica polita Fries, Novit. Fl. Suec. 63. 1819. "Ubique in arvis Scaniae [Sweden]." In the second edition of the Novitiae we are told that this is the only known station in Sweden. Well described, and in the second edition contrasted with the *V. agrestis* L. (*V. versicolor* Fries), both of which species of Fries were soon after illustrated in Reichenbach's Kupfersammlung kritischer Gewächse, plates 246 and 277 respectively. I am unable to maintain Fries' contrast as to pubescence and the veining of the sepals. For further discussion of this name and of the uncertain identity of the older *Veronica didyma* Tenore, Prod. Fl. Nap. 6. 1811, of Italy, see Ernst Lehmann in Bull. Herb. Boiss. II. **8**: 237–244. 1908. Tenore's mention of leaves profoundly crenate suggests *polita*, which is the species of this group commonest in southern Italy.

Veronica crenulata Sesse & Mociño, Fl. Mex. 5. 1892. "Habitat in montibus Sancti Eremi PP. Carmelitarum [Mexico. Mociño & Sesse]." Description appears to be of the species now considered, which is well-established in Mexico. Not *V. crenulata* Hoffm., 1803.

Ballast, roadsides and gardens, occasional from New York to Ohio, Florida and Texas; central Mexico; Argentina. Introduced from central and southern Eurasia.

15. VERONICA PERSICA Poir.

Veronica persica Poir., Encyc. Meth., Bot. **8**: 542. 1808. "Croît dans la Perse. On la cultive au Jardin des Plantes de Paris (V. v.)." Apparently this is our species, but description differs from prevalent forms in stating the leaves to be very obtuse and ordinarily slightly longer than the pedicels and the corolla to be shorter than calyx. However these states are easily reconcilable to certain stages or forms, and our species is a plant well-known from Persia. Lehmann doubtfully identifies *persica* as this species, but Lacaita (in Jour. Bot. **56**: 55. 1918), after examination of Poiret's type, declares these identical.

Veronica precox Raf., Atl. Jour. 79. 1832. "Grown in the [Bartram's Botanic] Garden [near Philadelphia] from seeds received from a place unknown." Not *V. praecox* All., 1789.

Veronica diffusa Raf., New Fl. Am. **4**: 38. 1838. "Native of ————————, naturalized on the Schuylkill near Philadelphia." Re-naming of *V. precox* Raf.

Veronica rotundifolia Sesse & Mociño, Fl. Mex. 5. 1892. "Habitat in Eremo P. P. Carmelitarum [Mexico, Mociño & Sesse]." Description apparently of the species now considered, although it may be that I have transposed the application of this name and *V. crenulata* S. & M. Not *V. rotundifolia* Ruiz & Pavon, 1798.

Fields and roadsides, occasional, or westward locally common, through Temperate North America, from Newfoundland and southern Alaska, south to Georgia, Texas and California; Mexico; Jamaica; Colombia; Chile. Introduced from southern Eurasia.

Our plant has also been known as *Veronica Tournefortii* C. C. Gmel., *V. Buxbaumii* Tenore, and *V. byzantina* (Smith) B.S.P. The two last are subsequent names, dating as species from 1811 and 1888 respectively. The original description of *V. Tournefortii* C. C. Gmel., Fl. Bad. **1**: 39. 1805, was composite, based upon a plant escaped from the botanic garden to fields near Carlsruhe, Baden, and upon a specimen brought by Tournefort from the Levant, which had recently been described as *V. filiformis* Smith (in Trans. Linn. Soc. **1**: 195. 1791.). The former element was probably our species, but the name *Tournefortii* should be applied to Tournefort's plant, and this is the basis of *V. filiformis*, a distinct though related species. Moreover the name was antedated by *Veronica Tournefortii* F. W. Schmidt, Fl. Boem. 7. 1793. (Description not seen, but the publication of this name verified by Lacaita in his discussion of this whole problem in Jour. Bot. **55**: 271–276. 1917.)

16. Veronica biloba L.

Veronica biloba L., Mant. 172. 1771. "Habitat inter Cappadociae segetes. D. Schreber."

Collected at Yonkers, New York, by E. P. Bicknell; also at Logan, Utah, by C. P. Smith, 1604 and 2167, and by him commented upon (under the name of *V. campylopoda* Boiss.) and illustrated in comparison with *V. persica* Poir., in Muhlenbergia **6**: 61. 1910.

Veronica campylopoda Boiss., Diagn. Pl. Nov. **4**: 80. 1844, distinguished from *V. biloba* as having its leaves and sepals narrower, the former hardly denticulate to entire above, its pedicels recurved, its seeds strongly rugulose and its style longer, half the length of the capsule, seems not to be definitely separable by any of these charac-

ters. Sir J. D. Hooker, Fl. Brit. India **4**: 295. 1884, assures us that the plant lacks distinctness—"I cannot distinguish it as a variety even"— and in confirmation of his statement that "the seeds vary much in depth of pitting," it may be mentioned that Reichenbach's plate cited by Boissier as illustrative of true *biloba* shows seeds deeply rugulose. Our plants seem quite intermediate, with the leaf-breadth and leaf-serration of *biloba*, but with the pedicels tending slightly to recurve and with the seeds and style as described for *campylopoda*. They match well a specimen of Boissier's collected at Roscheya, Syria, May, 1846, and named by him *Veronica campylopoda*.

17. VERONICA HEDERAEFOLIA L.

Veronica hederaefolia L., Sp. Pl. 13. 1753. "Habitat in Europae ruderatis." Diagnosis quoted from Linné, Fl. Suec. 7. no. 18. 1745, where the plant is said to occur "in Scania [Sweden] campestri in ruderatis ad urbes & pagos." Specimen from Sweden, from herbarium of Per Larson, seen in Herb. Columbia University.

(?) *Veronica reniformis* Raf. in Med. Repos. New York **5**: 360. 1808. "In New Jersey [C. S. Rafinesque in 1803–4]." I am unable to be certain of the identity of this from the short description: "stem procumbent, branched ['branded'], leaves sessile, reniform, hairy, entire, flowers axillar, solitary." It is possibly *V. hederaefolia* L., in which case the petioles must have been so short as to be unnoticed, or *V. arvensis* L., with unusually obscure serration of leaf, or else some introduced species not since reported from America.

Orchards and roadsides, occasional from New York to North Carolina. Introduced from Europe.

(To be continued.)

THE NORTH AMERICAN REPRESENTATIVES OF SCIRPUS CESPITOSUS.

M. L. FERNALD

THE common sedge, *Scirpus cespitosus* L.[1] which forms conspicuous wiry tussocks and often the dominant turf in the acid tundra and barren regions of the North and in America extends southward to the eastern coast and the mountains of New England, the Adirondacks,

[1] The name was originally published by Linnaeus as *cespitosus* and there is, therefore, no need to alter it, as is often done, to *caespitosus*.

the highest of the southern Alleghenies, bogs of the Great Lake States, and the mountains of Alberta and Washington, is essentially uniform throughout its broad range in North America and agrees with the plant of northern Asia and of northernmost and alpine Europe. In Europe, however, there is another plant which differs in some striking characters from the circumpolar form and which in Great Britain and the lower regions of Scandinavia, Denmark, France and Germany is known as *S. cespitosus*. In the latter plant the orifice of the upper sheath (at the base of the culm) is obliquely elongate, commonly more than 3 mm. long, and scarious-margined; the castaneous or purple spikelets are 6–8 mm. long and 5–8-flowered; and the perianth-bristles are usually upwardly barbellate. This is the plant designated by Palla as *Trichophorum germanicum*,[1] and taken up by Ascherson & Graebner as *S. cespitosus*, B. *germanicus* (Palla) Aschers. & Graebn.,[2] an entirely unnecessary combination since as early as 1789 it had been designated as *S. cespitosus*, β. *nemorosus* Roth.[3] It is well shown in the *English Botany*, t. 1029, or in Syme's edition, x. t. 1590, in *Flora Danica*, xi. t. 1861 and in Reichenbach's *Icones Florae Germanicae*, viii. t. 300, figure at left.

The wide-ranging circumpolar and alpine plant, on the other hand, has the orifice of the sheath about 1 mm. long and with a firm border; the stramineous or merely somewhat pale-brown spikelets 2–6 mm. long and 2–4-flowered and the perianth-bristles smooth or barely roughened. This is the plant designated by Palla as *Trichophorum austriacum*[4] and taken up by several European botanists as *Scirpus cespitosus*, B. *austriacus* (Palla) Aschers. & Graebn.[5]

Linnaeus included both plants in the *Species Plantarum*, but the "*Habitat in* Europae *paludibus cespitosis sylvaticis*" indicates that he had primarily in mind the plant of the lower altitudes, i. e., *S. cespitosus*, var. *nemorosus* Roth or *Tricophorum germanicum* Palla = *S. cespitosus*, B. *germanicus* (Palla) Aschers. & Graebn.

The circumpolar plant in some characters appears at first glance to be specifically distinct but it shows no constant difference in the fruit and some European plants, which in other characters are typical *S. cespitosus*, lack the barbs on the perianth-bristles. It is, therefore,

[1] Palla, Berichte Deutsch. Bot. Gesellsch. xv. 468 (1897).
[2] Aschers. & Graebn. Fl. Nordostd. Flachl. 135 (1898).
[3] Roth. Tent. Fl. Germ. ii. 53 (1789).
[4] Palla, l. c. (1897).
[5] Aschers. & Graebn. Syn. Mitteleurop. Fl. ii. Ab. 2, 300 (1904).

safest to treat the two plants, as most European students are doing, as two well marked geographic varieties. But, fortunately, the circumpolar variety, the plant now so generally called in Europe *S. cespitosus*, var. *austriacus*, cannot retain that name, so inappropriate for a circumpolar plant. Long before Palla had pointed out the differences between the extremes, Jacob Bigelow, finding the circumpolar plant on the White Mountains of New Hampshire and thinking, obviously from collections in different states of development, that he had two new species, described them as

"Scirpus obtusus—*Culmo tereti, nudo, monostachyo; spica lanceolata, squamis apice carnosis, obtusis*"

and as

"Scirpus bracteatus—*Culmo tereti, monostachyo; spica ovata, bracteis involucrata; flosculis monandris.*"[1]

Bigelow's *S. bracteatus* was obviously over-ripe (spica ovata) and his "flosculis monandris" an error due to the loss of some stamens, but Rafinesque characteristically rushed it into a new genus as *Aplostemon bracteatum*, "my genus *Aplostemon*, containing all the species of *Scirpus* with one stamen."[2]

Bigelow soon thereafter received from Europe material of true *Scirpus cespitosus* and accordingly reduced his two species to *S. cespitosus*, var. β. *callosus*,[3] the name which the plant treated as a variety should bear. If the plant is treated as a species it should be called *S. bracteatus* Bigel., the name *S. obtusus* having been preempted by Willdenow.

The nomenclature of the circumpolar plant may be summarized as follows:

SCIRPUS CESPITOSUS L., var. CALLOSUS Bigelow, Fl. Bost. ed. 2, 21 (1824). *S. obtusus* and *S. bracteatus* Bigel., N. E. Journ. Med. v. 335 (1816). *Aplostemon bracteatum* (Bigel.) Raf., Am. Mo. Mag. i. 441 (1817). *Trichophorum austriacum* Palla, Berichte Deutsch. Bot. Gesellsch. xv. 468 (1897). *S. cespitosus*, B. *austriacus* (Palla) Aschers. & Graebn. Syn. Mitteleurop. Fl. ii. Ab. 2, 300 (1904).

Var. *callosus*, the common American form of *S. cespitosus* is typical of acid bogs and tundra and, in eastern America at least, the peaty alpine regions of our granitic mountains. It forms stiffly resistent tussocks, with wiry culms and firm stramineous basal

[1] Bigel., N. E. Journ. Med. v. 335 (1816).
[2] Raf., Am. Mo. Mag. i. 441 (1817).
[3] Bigel. Fl. Bost. ed. 2, 21 (1824).

sheaths. Contrasted with the ubiquitous plant of acid peats is the representative of the species on slaty or calcareous ledges and gravels along the St. John and Aroostook Rivers in Maine. There the plant of sweet or basic ledges and gravel is associated with such calcicolous species as *Scirpus Clintonii* Gray, *Equisetum variegatum* Schleich., *Trisetum melicoides* (Michx.) Vasey, *Rynchospora capillacea* Torr., *Carex interior* Bailey, *Tofieldia glutinosa* (Michx.) Pers., *Viola nephrophylla* Greene, *Primula mistassinica* Michx., etc., and although in its spikelet, achene, bristles and short leaf-blade the plant suggests *S. cespitosus*, var. *callosus*, it forms comparatively soft tussocks, with almost filiform culms far less rigid than in var. *callosus*, and its very closely crowded culms are subtended by submembranaceous or scarious very narrow blackish or lead-colored scales. The same extreme variant occurs on the slaty gravel of the Gander River in Newfoundland, there associated with essentially the same species, so that the plant seems to be a definite variety characteristic of such habitats. As such it is here proposed as

SCIRPUS CESPITOSUS L., var. **delicatulus**, n. var., a var. *calloso* recedit culmis filiformibus vix rigidis, vaginis imis nigrescentibus vel griseis submembranaceis vel scariosis.—NEWFOUNDLAND: gravelly bank of Gander River, Glenwood, July 12 and 13, 1911, *Fernald, Wiegand & Darlington*, no. 4760. MAINE: abundant, wet gravelly or ledgy bank of St. John River, Fort Kent, June 16, 1898, *Fernald*, no. 2097 (TYPE in herb. New England Botanical Club). St. Francis, June 18, 1898, *Fernald*, no. 2098; ledgy bank of Aroostook River, Masardis, September 8, 1897, *Fernald;* wet sandy shore of Aroostook River, Fort Fairfield, July 5, 1893, *Fernald*, no. 121.

GRAY HERBARIUM.

A FREAK SWEET CLOVER.—Mr. B. W. Cooney, County Agriculturist, Goldendale, Washington, recently found and sent to Washington State College a "sample of sweet clover plant which has the appearance of being a Sport." He discovered it at Glenwood in a cultivated field of the plant, 45 acres in extent. The specimen shows five feet of the top of a vigorous well branched plant. The leaves are mostly withered and gone. The main and lateral branches bear numerous inflorescences. The younger ones that are still in bud are more densely puberulent than is usual in specimens of this species,

Melilotus alba Desr., but they are not otherwise distinctive. The older ones, however, are very different. The pedicels are 3 mm. or more in length, and, in many cases, branched. Thus the inflorescence is a panicle instead of the usual simple spike. The perianth appears to be normal, as does the androecium, but the gynoecium is quite aberrant. It protrudes from the middle of the flower as a slender green sickle-shaped or boat-shaped affair. The whole organ is very obviously foliaceous, and at the base can hardly be distinguished from a folded green leaf. It lacks the long white style, but towards the tip the two edges are approximate or slightly adnate and each bears two or three ovules. According to the strict definition this plant could not be a *Melilotus*, since it has 4 or 5 instead of 1–3 ovules, and, for that matter, it would be a Gymnosperm on account of its naked ovules. But taking into consideration all the evidence, the plant seems to be a teratological specimen of *Melilotus alba* Desr. showing multiplication of the branches of the inflorescence, phyllody of the pistil, and plurality of the ovules.—Harold St. John, Washington State College, Pullman, Washington.

Additions to the Flora of Isle au Haut.—At page 77 of Rhodora vol 22, I have spoken of Isle au Haut and of Mr. Hill's Flora of that vicinity. It now seems worth while to call attention to certain plants which have only recently been identified among my collections of 1919. I take this opportunity to thank Prof. Fernald for the identification of both specimens.

Salix coactilis Fernald I brought from a short walk on the east side of the island and it is by the roadside, but its exact location I do not know. Of course it must be found again if possible. Prof. Fernald's comment on this is "not previously known south of Bangor."

Carex norvegica Willd. I found in a brackish swampy place where the fresh water swamp comes down to the back of the beach, a characteristic habitat. Mr. Hill on p. 295 of his Flora speaks of this as absent from the region.

And while I am writing on plants hitherto unreported from this immediate region I may mention *Triglochin palustris* L., which grows in one spot at least, at the southerly end of the island.—Nathaniel T. Kidder, Milton, Massachusetts.

THREE PLANTS NEW TO RHODE ISLAND.—It may be well to put on record the following Rhode Island stations for plants which do not appear to have been listed from this state before.

Hedeoma hispida Pursh. Found in considerable quantity in Manton, Johnston, growing in a sandy sterile area. This previously has been reported in New England from "Vermont" by Eggleston in 1904 (Rhod. **6**: 142), Essex, Vt., by Blake in 1913 (Rhod. **15**: 167), Reading, Mass. (Rhod. **10**: 208), Putnam, Ct., by Harger in 1908 (Rhod. **10**: 208), Portland, Ct., by Bissell in 1911 (Rhod. **13**: 31).

Apocynum medium Greene. A single patch a few feet in diameter by a roadside in Scituate. The species is widely distributed in New England but the only other Rhode Island station known to me is on Block Island, where it was collected in 1913 by Fernald, Hunnewell and Long.

Potentilla tridentata, forma *hirsutifolia* Pease. A small quantity found in Scituate, first observed by Mr. George H. Leland. Previously reported by Pease in 1914 (Rhod. **16**: 195) from Province of Quebec, Maine, New Hampshire and Massachusetts; also a transitional form in Connecticut.—J. FRANKLIN COLLINS, Providence, Rhode Island.

INCORPORATION OF THE NEW ENGLAND BOTANICAL CLUB.—At the twenty-fifth annual meeting of the New England Botanical Club, which was held at the rooms of the Twentieth Century Club in Boston, December 3, 1920, the following officers were elected for the ensuing year: President, Nathaniel T. Kidder (for the second time in the history of the Club); Vice President, W. J. V. Osterhout; Corresponding Secretary, E. L. Rand; Recording Secretary and Treasurer, E. F. Williams; Phaenogamic Curator, F. W. Hunnewell; Cryptogamic Curator, J. F. Collins; Librarian, Walter Deane; Councillors, M. L. Fernald, C. H. Knowlton, and R. A. Ware.

As the Club has from time to time received by gift or legacy collections of considerable value, and since it must, as opportunity permits, make provision for their care, it has been thought best to place the Club upon a more regular legal basis than that of informal association. Accordingly, at its meeting on January 7, 1921, after due consideration and on legal advice, the New England Botanical Club

was formally dissolved and its members voted to re-associate themselves, under the same officers, as THE NEW ENGLAND BOTANICAL CLUB, INC.—a corporation under the laws of the Commonwealth of Massachusetts. The transfer of property rights and obligations from the old to the new organization was accomplished with due attention to legal formalities.

LINCOLN WARE RIDDLE, Assistant Professor of Cryptogamic Botany and Associate Curator of the Farlow Herbarium, Harvard University, died at his home in Cambridge, Massachusetts, January 16, 1921. Dr. Riddle had been for many years a valued member of the New England Botanical Club. From 1910 to 1917, he was the curator of its cryptogamic collections, and, from 1917 to 1920, its president. In May, 1920, he was chosen an associate editor of RHODORA to succeed the late Frank Shipley Collins. An account of Dr. Riddle's life and scientific work will appear in an early issue.

Vol. 22, no. 264, including pages 185 to 207 and title-page of the volume, was issued 15 February, 1921.

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Rhodora

JOURNAL OF

THE NEW ENGLAND BOTANICAL CLUB

Vol. 23. February, 1921. No. 266.

"VERONICA" IN NORTH AND SOUTH AMERICA

FRANCIS W. PENNELL

(*Continued from p. 22.*)

II. **VERONICA** L., Subgenus 2. EUVERONICA Pennell

Veronica L., Sp. Pl. 9. 1753. Type species, *V. officinalis* L.,[7] of Europe.

A. Capsule pubescent. Stems, pedicels, leaves and sepals pubescent. Leaf-blades oval or ovate, crenate-serrate to dentate. Plants of dry soil.

Leaf-blades dentate, cordate or truncate at base. Sepals 3.5–5 mm. long, linear-lanceolate, exceeding the capsule. Capsule with hairs not glandular nor dark-jointed. Plant ascending or erect.

Sepals unequal, the longest 4–5 mm. long. Capsule slightly notched. Style 4–5 mm. long, longer than the capsule. Leaf-blades sessile or nearly so. Racemes over 10-flowered, the pedicels more than 1 mm. long.

Corolla 7–8 mm. long, violet-blue, the largest lobes ovate. Anterior sepals much exceeding the posterior. Capsule longer than wide. Racemes 30–60-flowered, the pedicels scarcely exceeding their bracts. Leaf-blades coarsely dentate. Stem erect, 4–8 dm. tall.....18. *V. latifolia.*

Corolla 5–6 mm. long, paler violet-blue, the largest lobes nearly orbicular. Anterior sepals slightly exceeding the posterior. Capsule wider than long. Racemes 10–20-flowered, the pedicels much exceeding their bracts. Leaf-blades crenately dentate. Stem ascending, 1–3 dm. tall....19. *V. Chamaedrys.*

Sepals equal or nearly so, 3.5–4 mm. long. Capsule deeply notched, wider than long. Style

[7] Selected, among the several species common to both Linné and Tournefort, which answer Linné's generic characterization in Genera Plantarum, ed. V. 10. 1754, and are native to Linné's country Sweden, because of its officinal nature. This species had a long historic right to the name "Veronica."

.5 mm. long, much shorter than the capsule. Leaf-blades shortly petioled. Racemes 5–10-flowered, the pedicels less than 1 mm. long.....20. *V. javanica.*

Leaf-blades oval, crenate-serrate, narrowed to a petiolar base. Sepals 2–3 mm. long, oblong-lanceolate, shorter than the capsule. Capsule as wide or wider than long, notched, with hairs dark-jointed and some of them glandular. Style 2.5–3.5 mm. long, shorter than the capsule. Plants repent, ascending at apex.

Corolla 8–9 mm. long, violet-blue. Capsule 5 mm. long, as wide as long, its lobes rounded, the most distal point of each midway between the style and the lateral margin. Racemes 3–5-flowered, the pedicels longer than the capsule. Leaf-blades about 2 cm. long, crenate-serrate with very low teeth, hirsute above, glabrous beneath, conspicuously ciliate. Stem less than .5 dm. long.....21. *V. grandiflora.*

Corolla 3–4 mm. long, pale-lavender, with lavender blue lines on the posterior side. Capsule 3–4 mm. long, wider than long, its lobes with the most distal point of each near the lateral margin. Racemes 20–30-flowered, the pedicels shorter than the sepals or capsules. Leaf-blades 2–5 cm. long, crenate-serrate with prominent teeth, pubescent on both surfaces but not obviously ciliate. Stem extensively repent, 2 dm. long or longer.....22. *V. officinalis.*

A'. Capsule glabrous or with a few minute gland-tipped hairs. Stems, pedicels, leaves and sepals glabrous, or very rarely pubescent. Leaf-blades oblong-ovate to linear, finely serrate to entire. Aquatics.

B. Capsule not conspicuously wider than long, and scarcely or not two-lobed. Sepals nearly or quite equaling the capsule, slightly unequal, the anterior longer. Leaf-blades oblong-ovate to lanceolate, obtuse to acuminate, serrate to crenate-serrate. Stem glabrous or pubescent with minute gland-tipped hairs. Racemes usually of more than 10 flowers, the relatively stout pedicels ascending-spreading.

Leaf-blades all petioled, prevailingly ovate-oblong, acutish to obtuse. Racemes usually 10–25-flowered, the pedicels 5–13 mm. long. Plants mainly emersed, glabrous throughout. Capsule slightly wider than long, notched.

Leaf-blades oblong-oval, widest at or above the middle, narrowed at base, mostly broadly rounded at apex. Style 1.5–2 mm. long, obviously shorter than the capsule. Plant extensively repent, ascending at apex....23. *V. Beccabunga.*

Leaf-blades lanceolate to ovate, widest at or near the base, mostly acute or acutish at apex. Style 2–3 mm. long, scarcely shorter than the capsule. Plant repent only at base, soon ascending-erect.....24. *V. americana.*

Leaf-blades, at least the upper on the flowering-stems, sessile and clasping, obtuse to acuminate. Racemes 15–60-flowered, the pedicels 3–8 mm. long. Plants of deeper water, usually mostly submersed.
Capsule 2.5–4 mm. long. Style 1.3–2 mm. long. Cauline leaf-blades acute to acuminate.
Sepals acute to acuminate. Capsule scarcely wider than long, not or slightly notched. Leaf-blades serrate with close teeth (four or more to 1 cm.). Racemes usually 30–60-flowered, with pedicels 4–8 mm. long.
Stem distally, rachis and pedicels glabrous. Capsule globose-ovoid, acutish or rounded, not or scarcely emarginate. Style 1.5–2 mm. long. Leaf-blades oblong-ovate, mostly broadest about the middle, the lower usually obviously narrowed at base or petioled.
Sepals acuminate, 4–5 mm. long. Capsule 3–4 mm. long. Pedicels 5–8 mm. long.....25. *V. Anagallis-aquatica.*
Sepals acute, 2.5–4 mm. long. Capsule 2.5–3 mm. long. Pedicels 3–5 mm. long.....25a. *V. Anagallis-aquatica Brittonii.*
Stem distally, rachis and pedicels finely pubescent with minute gland-tipped hairs. Capsule nearly globose, slightly emarginate. Style 1.3–1.5 mm. long. Leaf-blades lanceolate, mostly broadest near the base, all obviously clasping.....26. *V. glandifera.*
Sepals obtuse to acutish. Capsule obviously wider than long, evidently notched. Leaf-blades crenate-serrate with remote teeth (two to three to 1 cm.), lanceolate, all clasping. Racemes usually 15–30-flowered, the pedicels 3–6 mm. long.
Stem distally, rachis and pedicels glabrous. Style 1.4–1.6 mm. long.....27. *V. catenata.*
Stem distally, rachis and pedicels finely pubescent with minute gland-tipped hairs. Style 1.5–1.8 mm. long 27a. *V. catenata glandulosa.*
Capsule 2 mm. long, globose, not or scarcely notched. Style .7–1 mm. long. Cauline leaf-blades oblong-lanceolate, obtuse or obtusish. Stem distally, rachis and pedicels usually pubescent with minute gland-tipped hairs.....28. *V. undulata.*
B′. Capsule much wider than long, strongly two-lobed. Sepals shorter than the capsule, equal. Leaf-blades linear or lanceolate, remotely setaceous-toothed or entire. Stem glabrous or pubescent with glandless hairs. Racemes 5–20-flowered, the filiform pedicels reflexing in fruit.....29. *V. scutellata.*

18. Veronica latifolia L.

Veronica latifolia L., Sp. Pl. 13. 1753. "Habitat in Helvetia, Bithynia." The identity of this species has been much disputed, on one side being such statements as Bentham in DC., Prod. **10**: 469. 1846, who considers it to be a broad-leaved form of *V. Teucrium* L., on the other Kerner in Oesterr. Bot. Zeitschr. **23**: 367–369. 1875, who makes a strong plea for its identification as *V. urticaefolia* Jacq., Fl. Austr. **1**: 37. *pl. 59.* 1773. Certainly some of the synonyms cited by Linné appear to be *V. urticaefolia,* a species very readily distinguished by its slender stem, thin smooth leaves which are sharply serrate and long-acuminate, and its shorter racemes, on the slender pedicels of which are borne the short sepals and small pinkish corollas. Linné's description, in the use of the words "foliis rugosis dentatis," certainly does not describe *urticaefolia,* and moreover one can scarcely believe that he would have omitted characterization of the leaf-acumination. Sir J. E. Smith, in Rees Cyclop. **37**: Art. Veronica, no. 58, describes the Linnean specimen and emphatically asserts its kinship to *V. Teucrium* L., not to *urticaefolia* Jacq. In the absence of citation to other specimens studied by Linné, the specimen of the Linnean Herbarium should stand as type. Sir J. E. Smith carefully contrasts this with *V. Teucrium* L., but study of the varying leaf-form of the latter confirms Bentham's view as to their identity.

Veronica Teucrium L., Sp. Pl. ed. II. 16. 1762. "Habitat in Germania." Linné possessed no specimen of this in his herbarium, which readily explains his describing as new a narrower-leaved form of this species than his own *V. latifolia.* The specific name is derived from "Teucrii IV tertia species Clus. hist. 1 p. 349." L'Ecluse, Rar. Pl. Hist. 349. 1601, figures and briefly describes a plant, which is an ovate-leaved form of the species, and says that it grows "in herbosis collium jugis [Pannoniae . . . . Austriae Moraviae . . . . & Bohemiae]." Linné's description of his plant as with leaves "ovatis rugosis dentatis" shows the similarity of this to his own *latifolia.*

Roadsides, pastures and waste land, New Hampshire to Ontario, New Jersey and Ohio; introduced from Europe.

19. Veronica Chamaedrys L.

Veronica Chamaedrys L., Sp. Pl. 13. 1753. "Habitat in Europae pratis." The diagnosis is essentially taken from Linné, Fl. Suec. 5, no. 12. 1745, where the plant is stated to occur in Sweden "in pratis ubique." Evidently this is the species now considered. Several specimens from Sweden seen, one collected by Dr. W. A. Murrill at Upsala, July, 1902, being probably a topotype.

Roadsides and meadows, occasional from Prince Edward Island to Ontario, New Jersey and Ohio. Introduced from Europe.

20. VERONICA JAVANICA Blume.

Veronica javanica Blume, Bijdr. Fl. Nederl. Ind. 742. 1826. "Crescit in cacumine Sederato et ad cataractas fluvii Tjikundul montis Gede [Java]." The brief original description, especially in the phrase "spicis axillaribus," would seem to denote the plant here considered. I have followed Sir J. D. Hooker, Fl. Brit. Ind. **4**: 296. 1884, in adopting this name, as the only named specimen which I have for comparison, Griffith 3921 from East Himalaya distributed by Kew Gardens as "Veronica Maddenii Edg.," is evidently this species. There is also a previously unnamed specimen, in Herb. New York Botanical Garden, from the Liu Kiu Islands.

Petropolis, Brazil, collected by J. Ball in 1882. Introduced from the Oriental Region.

21. **Veronica grandiflora** J. Gaertn.

Veronica grandiflora J. Gaertn. in Novi Comm. Acad. Petrop. **14**: 531. *pl. 18, f. 1.* 1770. "Kamtschatkam pro patria sua . . . . in pratis alpinis . . . ., referente Stellero, copiose nascitur." A full description, and a carefully drawn illustration, make the application of this name unmistakable, although the capsule is described as smooth (the word "laevis" however, not the word "glaber"). Apparently this was accidentally renamed by the younger Linné (Suppl. 83. 1781), who says of it: "*Veronica kamtchatica* Gaertner Act. petropol. Habitat in Kamtschatka." Specimens, L. Stejneger 106, etc., seen from Bering Island, along the coast of Kamchatka.

Western Aleutian Islands (Kiska and Attu Islands). Also in Kamchatka.

Similar to, but much larger than, *Veronica aphylla* L., Sp. Pl. 11. 1753, of the Alps of Europe; differs by having its stems frequently 1 dm. long, its peduncles longer, its leaves 2.5–4 cm. long (not 1–2 cm. long), obovate and more acute, its corollas 8–9 mm. long (not 5 mm. long), and its style 8–9 mm. long, exserted, probably as long as the capsule (not 4 mm. long and only one-half to two-thirds length of capsule).

22. VERONICA OFFICINALIS L.

Veronica officinalis L., Sp. Pl. 11. 1753. "Habitat in Europae sylvestribus sterilibus." Refers to Linné, Mat. Med. 4, no. 11. 1749; then to Linné, Fl. Suec. 4, no. 8. 1745, where the plant is said to occur in Sweden "frequens in sylvis praesertim exustis," and its medical uses are mentioned. The Linnean specimens are more fully described by Sir. J. E. Smith in Rees Cyclop. **37**: Art. Veronica. no. 53. 1819. Specimen in Herb. New York Botanical Garden, collected at Upsala, Sweden, July, 1902, by Dr. W. A. Murrill, is probably a topotype.

Fields, barrens and open woods, mostly common; from Newfoundland and Michigan to North Carolina and Tennessee. Apparently introduced from Eurasia, although usually in seemingly native habitats.

23. VERONICA BECCABUNGA L.

Veronica Beccabunga L., Sp. Pl. 12. 1753. "Habitat in Europa ad rivulos." Diagnosis quoted from Linné, Fl. Suec. 5. no. 11. 1745, where it is stated that in Sweden the plant "habitat in fossis, rivulis, scaturiginibus passim," and that it is the "Beccabungae Herba Conserva, Aqua" of the Pharmacopoeas.

Running brooks, ditches and wet fields, well established in Quebec, also at Rochester, New York and Perth Amboy, New Jersey. Introduced from Eurasia, where this species is as wide-spread as on this continent is the following near relative.

24. **Veronica americana** Schwein.

Veronica Beccabunga americana Raf., Med. Fl. **2**: 109. *pl. 94.* 1830. "Grows from Canada to Virginia and Kentucky, near waters, brooks, &c." Well described, and contrast given with *V. Beccabunga* as understood by Rafinesque. Apparently this plant was independently redescribed under this name by Torrey in Fl. New York **2**: 41. 1843, whose type I have seen in Herb. Columbia University.

Veronica americana Schwein.; Benth. in DC. Prod. **10**: 468. 1846. "*Veronica americana* (Schweinitz! mss.) . . . . . In America boreali a Canada et Carolina usque ad flum. Oregon et in ins, Sitcha . . . . . (v. s.)" Specimen seen in Herb. Academy of Natural Sciences of Philadelphia, labeled "Bethl." [= Bethlehem, Pennsylvania], collected by Schweinitz, may be an isotype. Well contrasted with *V. Beccabunga* L., instancing leaf-form and more erect habit.

Veronica americana hirsuta Coleman, Cat. Fl. Pl. S. Michigan 27, 1874. "Southern peninsula of Michigan." Described as "plant quite large, 24 to 30 inches high, very hirsute." I have never seen a pubescent form of this species, and Coleman's specimen, if extant, should be studied.

Veronica americana crassula Rydb. in Mem. New York Bot. Gard. **1**: 353. 1900. "In bogs, at an altitude of 2000–2500 m. Montana: Little Belt Pass, 1896, Flodman, 778 (type)." Type seen in Herb. New York Botanical Garden. This represents the dwarfed alpine state of the species, which may better be considered a forma.

Veronica oxylobula Greene, Pittonia **5**: 113. 1903. "Type specimens from Golden City, Colorado, collected by myself in 1871." Supposed to be distinguished by "its entire or subentire foliage and the longer and almost acute capsules," features of variability within this species.

Veronica crenatifolia Greene, l. c. 114. 1903. "The type . . . is Baker, Earle and Tracy's n. 33, from along the Mancos River in southern Colorado, 22 June, 1898." Isotypes seen in Herb. New York Botanical Garden and U. S. National Herbarium. Apparently supposed to be distinguished by its smaller size and crenate leaves, variations frequent in *V. americana.*

Swamps, springs and woodland rills, from Newfoundland, Ontario and Alaska, south, eastward to South Carolina and Tennessee, westward to Chihuahua, California, and the Valley of Mexico; also on the Commander Islands on the western side of Bering Sea. Generally common over this wide area.

Veronica americana appears to be only inconstantly distinguishable from *V. Beccabunga* by its leaf-form and more erect habit. The leaf is mostly narrower, widest near the truncately rounded or subcordate base, narrowing to the acute or obtuse apex, and borne on frequently shorter pedicels. The capsule-shape is the same, nearly globose, flattened and emarginate at apex, the corolla, sepals and pedicels are of about the same length as in that species, but the last are usually more slender. The styles are longer and usually more slender in *americana.* The leaves vary from serrate through crenate to nearly or quite entire.

25. **Veronica Anagallis-aquatica** L.

Veronica Anagallis-aquatica L., Sp. Pl. 12. 1753. "Habitat in Europa ad fossas." Description quoted from Linné, Fl. Suec. 5, no. 10. 1745, where the plant is stated to occur in Sweden "in fossis ad vias & paludes Uplandiae, Scaniae &c." Described with leaves serrate, and with citations to Tournefort and Bauhin who both term the leaves oblong. The Swedish plant is well described by Nyman, Utkast Sv. Vaxt. Naturh. Sver. Fanerog. 164. 1867, who tells us that its leaves are lanceolate or oval-lanceolate, pointed, and its capsules are rounded, very shallowly notched. All which indicates the present broad-leaved plant with scarcely or not notched capsules, not another plant of northwestern Europe which has elongate acuminate leaves, and capsules decidedly notched, as broad as or broader than long. Our plant has the lower leaves and those of autumnal shoots narrowed or petioled at the base, a condition mentioned in such exact descriptions as Hayek, Fl. Steiermark **2:** 168. 1912; also the short round form of these autumnal leaves is mentioned in Villars, Hist. Pl. Dauphine **2:** 14. 1787.

Veronica lepida Phil. in Anal. Univ. Chile **91:** 110. 1895. "Habitat ad Vicum Cartajena (haud procul a Valparaiso [Chile]), Februario, 1895 lecta." Described because the petioled lower leaves were noticed.

Veronica micromera Wooton & Standley in Contrib. U. S. Nat. Herb. **16:** 174. 1913. "Type in the U. S. National Herbarium, no. 686250, collected along ditches about Shiprock, on the Navajo Reservation [New Mexico], July 25, 1911, by Paul C. Standley (no. 7283). Altitude 1,425 meters." Type seen in U. S. National Herbarium. A dwarf form, with small leaves which are more obviously narrowed at base.

Slow-flowing streams, wide-spread through North and South America; specimens seen from Michigan, Utah, New Mexico, Arizona, Argentina and Chile. Also of wide occurrence in Eurasia; specimens seen from Germany, Switzerland, Italy, Albania, Algeria and Syria. Of this critical species-group this is the most widely dispersed and probably the original element.

25a. **Veronica Anagallis-aquatica Brittonii** (Porter) Pennell, comb. nov.

Veronica Anagallis latifolia Britton in Bull. Torr. Bot. Club **12:** 49. 1885. "In the latter part of September, 1883, ... near Mahwah, Bergen Co., New Jersey, I noticed [it] in a small stream . . . . ." Type seen in Herb. Columbia University. Not *V. Anagallis latifolia* Schultz, Prod. Fl. Stargard. Suppl. 3. 1819 (which is *V. Anagallis-aquatica* L.).

Veronica Brittonii Porter; Pennell in Torreya **19:** 168. 1919. "Type, base of Marble Hill, above Phillipsburg, New Jersey, collected in flower and fruit June 24, 1892, T. C. Porter; in herbarium Columbia University at the New York Botanical Garden."

Slow-flowing streams, western Connecticut to northern Pennsylvania. For list of localities see Torroya **19**: 170. 1919.

Perhaps not worthy of even varietal distinction.

26. **Veronica glandifera** Pennell

Veronica perfoliata Raf., New Fl. Am. **4**: 37. 1838. "Florida." Description almost certainly of the plant now considered, which however is not authentically known from so far south. The clasping opposite leaves of *V. glandifera,* till closely seen, appear connate. Not *V. perfoliata* R. Br., 1810.

Veronica glandifera Pennell in Torreya **19**: 170. 1919. "Type, vicinity of Suffolk, Nansemond County, Virginia, collected in flower and fruit, May 27, 1893, N. L. Britton and J. K. Small; in herbarium Columbia University at the New York Botanical Garden."

Slow-flowing streams, in limestone, Virginia and Ohio to North Carolina and Tennessee. Perhaps intergrades with *V. catenata glandulosa.*

The petioled leaves of late-summer shoots are well shown on specimens of Bruce Fink 262 from Oxford, Ohio, collected August 8, 1908.

While in pubescence this species parallels Palaearctic derivatives of *Veronica Anagallis-aquatica* L., I am unable to place our plant of eastern North America as of the same species as any of these. Such species are: *V. anagalloides* Guss., Pl. Rar. Sic. 5. *pl. 3.* 1829, which has a capsule decidedly longer than wide, and not or scarcely emarginate; *V. oxycarpa* Boiss., Diagn. I. **7**: 44. 1846, with acute capsule and leaves narrowed at base; and *V. salina* Schur, Enum. Pl. Transsilv. 492. 1866, very similar to *V. anagalloides.*

27. **Veronica catenata** Pennell, sp. nov.

Flowering stem 1–3 dm. long, glabrous throughout. Leaves lanceolate, acute or acutish, crenate to nearly entire, 3–5 cm. long, 1 cm. wide, all clasping, when submersed elongating and reaching 12 cm. long and 2 cm. wide. Racemes axillary to the upper leaves, 6–12 cm. long, 15–25-flowered. Bracts narrowly lanceolate, 4–5 mm. long. Pedicels 3–5 mm. long, glabrous. Sepals 3–3.5 mm. long, lance-ovate, obtusish. Corolla-lobes pale-blue. Style 1.2–1.7 mm. long. Capsule 3 mm. long, 3.5 mm. wide, broad-globose, decidedly emarginate. Seeds 0.5 mm. long, yellow-brown.

Type, Hot Springs, South Dakota, collected in flower and fruit June 16, 1892, P. A. Rydberg 926, in Herb. New York Botanical Garden. Named from the chain-like aspect of the long racemes of short-pedicelled flowers.

Slow-flowing streams, plains, from North Dakota and Saskatchewan to Kansas and New Mexico, southward west to Nevada and southern California.

27a. **Veronica catenata glandulosa** (Farwell) Pennell, comb. nov.

Veronica Anagallis-aquatica glandulosa Farwell in Rep. Mich. Acad. Sci. **19**: 249. 1917. "Zoo Park, near Royal Oak [Michigan], [Farwell] No. 4323, July 13, 1916." Not *V. Anagallis-aquatica glandulosa* Schur, Enum. Pl. Transsilv. 492. 1866. Description inadequate, but apparently of the plant now considered. As this is a small plant and moreover is the only glandular-pubescent "Anagallis-aquatica" known from Michigan, I apply the name to this.

Slow-flowing streams, western New York to Minnesota, South Dakota, Kentucky and Oklahoma; also in western Massachusetts and in southeastern and southern Pennsylvania. Probably intergrades with *V. glandifera,* and for the latter, in Torreya **19**: 170, I have mistaken plants of our New York "Local Flora."

28. Veronica undulata Wall.

Veronica undulata Wall.; Roxb., Fl. Ind. **1**: 147. 1820. "Discovered in the Turraye [India] by Mr. W. Jack." Specimen in Herb. Columbia University, labeled "Nepal Wallich," may be an isotype.

Ballast, Portland, Oregon, and Mobile, Alabama. Introduced from southeastern Asia, where it occurs from northern India through southern China, and in Japan.

Occasionally nearly or quite glabrous, but then readily distinguished by the small size of the capsule and style.

29. **Veronica scutellata** L.

Veronica scutellata L., Sp. Pl. 12. 1753. "Habitat in Europae inundatis." Diagnosis quoted from Linné, Fl. Suec. 4. no. 9. 1745, where the plant is said to grow in Sweden "in locis per hyemem inundatis frequens." Evidently the plant now considered.

Veronica uliginosa Raf. in Am. Mo. Mag. **2**: 175. 1818. "Veronica scutellata Pursh . . . . Fl. Am. Sept. **1**: 11." In his Fl. Am. Sept. 11. 1814, Pursh states of "Veronica scutellata" that "the American plant has longer leaves than any of the European specimens I have seen," a condition not verified by the material at hand to-day though Pursh's statement evidently misled Rafinesque into assuming for it specific distinctness.

Veronica connata Raf., Med. Fl. **2**: 110. 1830. "In west Kentucky." Very briefly characterized and leaves said to be "connate;" surely they were merely cordate-clasping and opposite.

Meadows and swales, Newfoundland and Yukon to Virginia, Indiana, Wyoming, and California.

Occasionally occurs in a form more or less pubescent throughout, forma **villosa** (Schumacher) Pennell [*Veronica scutellata villosa* Schumacher, Enum. Pl. Saell. **1**: 7. 1801; also *V. scutellata pilosa* Vahl, Enum. Pl. **1**: 70. 1805; *V. scutellata pubescens* Koch, Syn. Fl. Germ. et Helv. 524. 1837.]. This occurs sporadically occasional throughout the range of the species.

III. **HEBE** Commerson

Hebe Comerson; [Juss., Gen. Pl. 105. 1789, generic diagnosis only;] J. F. Gmelin, Syst. Nat. **2**: 27. 1791. Type species, *Hebe magellanica* J. F. Gmel.

Leaves lanceolate, acuminate to a small blunt tip, entire, not revolute, 6–7 cm. long. Racemes 5–13 cm. long, many-flowered. Sepals acuminate, 2–3 mm. long. Corolla with the oblong lobes shorter than or but little longer than the narrow tube. Stamens and style longer than the corolla and conspicuously exserted, the latter slender, 5–6 mm. long. Capsule oval in outline, relatively thin-walled. Stem minutely pubescent when young, especially between and proximad to bases of leaves, becoming glabrate; bark slightly wrinkled in drying.

Racemes 13 cm. long; rachis, pedicels and lanceolate sepals finely pubescent. Corolla 5 mm. long, its lobes slightly shorter than the tube. Leaves attenuate-acuminate. Internodes on flowering shoots about 3 cm. long	1. *H. salicifolia*
Racemes 5–7 cm. long; rachis, pedicels and lance-ovate sepals puberulent. Corolla not seen. Leaves narrowing to a blunt tip. Internodes on flowering shoots less than 1 cm. long	2. *H. blanda*
Leaves elliptic-oval, apiculate, the margin revolute, callose, and at times obscurely crenate, 2–3 cm. long. Racemes 2 cm. long, few-flowered. Sepals acute to obtuse, 4 mm. long. Corolla 8 mm. long, the broadly ovate lobes much longer than the broad tube. Stamens not longer than the corolla, the stout style 4 mm. long. Capsule elliptic-oval in outline, thick-walled. Stem densely and persistently pubescent with pale hairs on side between and proximad to bases of leaves, below leaf-bases reddish, glabrous and shining; bark much wrinkled in drying...	3. *H. elliptica*

1. **Hebe salicifolia** (Forst.) Pennell, comb. nov.

Veronica salicifolia Forst., Fl. Ins. Austr. Prod. 3. 1786. "[Noua Zeelandia, G. Forster]." Several specimens from New Zealand seen, and one collected by A. H. Cockayne 8041, and labeled "*Veronica salicifolia* Forst. Typical South Island form," shows precisely the slender finely pubescent pedicels, small flowers, and acuminate, almost attenuate leaves of our plant. Type species of genus *Panoxis* Raf., Med. Fl. **2**: 109. 1830.

Veronica Fonkii Phil. in Linnaea **29**: 110. 1857–8. "En las playas y barrancas de Chonos,' in litore et valleculis, legit . . . Dr. Fr. Fonk." Specimen in Herb. Columbia University, labeled "*Veronica Fonki* Ph. Chonos, legit Philippi, com. am Treviranus 1864," is doubtless an isotype. This seems to be the same as the plant of New Zealand.

Chonos, Chile. Also in South Island, New Zealand.

2. **Hebe blanda** (Cheesem.) Pennell, comb. nov.

Veronica amabilis blanda Cheesem., Man. New Zealand Fl. 506. 1906. "Port Chalmers [Otago, South Island, New Zealand] Petrie! . . . . . ." Specimen in Herb. New York Botanical Garden, collected at Anita Bay, Otago (where it forms "a considerable part of the 'coastal Scrub'") appears to be exactly our plant, and to agree with Cheeseman's variety.

Southern Patagonia. Also in South Island, New Zealand.

3. **Hebe elliptica** (Forst.) Pennell, comb. nov.

Veronica elliptica Forst., Fl. Ins. Austr. Prod. 3. 1786. "[Noua Zeelandia, G. Forster]," Several specimens from New Zealand seen, two from Port Otway and Tuesday Bay respectively, agreeing exactly with our plant. Also a specimen from the Auckland Islands, Wilkes Expedition, is quite the same.

Veronica decussata [Soland. in] Ait., Hort. Kew. **1**: 20, 1789. "Nat. of Falkland Islands. Introd. 1776, by John Fothergill." Described as with bracteoles on pedicels, an appearance probably caused by the terminal bractlets of the raceme appearing, while the bud of the rachis is suppressed.

Hebe magellanica J. F. Gmel., Syst. Nat. **2**: 27. 1791. Based upon *Hebe* Juss., Gen. Pl. 105. 1789, where the name is attributed to Commerson and the plant said to be from Magellan. Evidently collected by Commerson at the Straits of Magellan in 1767–8.

Veronica Simpsonii Phil. in Anal. Univ. Chile **1873**: 26. 1873. "Enrique Simpson trajo de las orillas del rio Aysen, en Patagonia." The careful description of the branch, leaves, fruiting inflorescence, capsules and seeds appears to denote the species now considered.

Southern Patagonia and Falkland Islands. Also in the Auckland Islands and South Island of New Zealand.

NOMINA EXCLUDENDA.

Veronica caroliniana Poir., Encyc. Meth., Bot. **8**: 520. 1808. "Communiquée par M. Bosc, qui l'a recueillie dans la Caroline." This is *Cynoctonum Mitreola* (L.) Britton, of the Loganiaceae. Not *V. caroliniana* Walt., 1788.

Veronica cinerea Raf., New Fl. Am. **4**: 39. 1838. "From Origon." Description of plant as "cinereous villose, leaves alternate . . . . flowers spicate very dense sessile . . . . stamens very long" appears to denote some species of *Synthyris*.

Veronica fluminensis Vell., Fl. Flum. 11. 1825; Icones **1**: *pl. 25*. 1827. "Abunde provenit locis umbrosis ad vias maritimas Regii Praedii Sanctae Crucis [Brazil]." Description and illustration show a plant of the Acanthaceae.

Veronica litoralis Vell., Fl. Flum. 10. 1825; Icones **1**: *pl. 24*. 1827. "Silvis maritimis Regii Praedii Sanctae Crucis [Brazil] prope litus, ad loca arenosa habitat." Description and illustration show a plant of the Acanthaceae.

Veronica marilandica L., Sp. Pl. 14. 1753. "Habitat in Virginia." According to B. D. Jackson (in Proc. Linn. Soc. **14**. Suppl.: 150. 1912), Linné transferred his specimen bearing this name to *Polypremum procumbens* L. Both his description and that in Gronovius' Fl. Virg. 4. 1739, indicate this plant of the Loganiaceae. I cannot locate the reference which is erroneously cited as: "*Veronica marilandica* Murr. Comm. Gotting. **11**: t. 3. 1782."

Veronica missurica Raf. in Am. Monthly Mag. **3**: 175. 1818. New name for *Veronica reniformis* Pursh, which was a species of *Synthyris*. See below.

Veronica Purshii G. Don, Gen. Hist. Dichl. Pl. **4**: 573. 1838. "Native on the banks of the Missouri. *V. reniformis* Pursh . . ., but not of Rafin." A species of *Synthyris*. See below.

Veronica reniformis Pursh, Fl. Am. Sept. **1**: 10. 1814. "Collected by Messrs. Lewis and Clark in boggy soil, on the banks of the Missouri . . . . . v. s. in Herb. Lewis." Type was apparently a plant collected on Hungry Creek, in what is now Montana, June 26, 1806, and an isotype of this in the Herbarium of the Academy of Natural Sciences of Philadelphia was determined by Robinson and Greenman [in Proc. Acad. Nat. Sci. Phila. **1898**: 39. 1898] as *Synthyris reniformis major* Hook. Pursh's description is inaccurate, but I think must certainly apply to this collection which is the species, *S. major* (Hook.) Heller.

Veronica rotundifolia Ruiz & Pavon, Fl. Peruv. et Chil. **1**: 6. 1798. "Habitat copiose in Peruviae uliginosis ad Pillao vicum." This is a species of *Sibthorpia.*

Veronica sparsiflora Raf., Atl. Jour. 79. 1832. Described from a plant in the Bartram Botanical Garden, Philadelphia, Pa., which was said to have been "native of Arkansas or Texas, received from Prof. Nuttall." I know of no American species at all fitting this description: "stem erect, simple round solid, leaves opposite sessile cuneate oblong entire obtuse. Raceme terminal lax very long, flowers scattered, bracts linear oblong obtuse, pedicels filiform. Capsules bilobed subcompressed. Annual . . . . . Stem 1 or 2 feet high. Flowers vernal purpurescent handsome. Corolla rotate, segments of the calix unequal oblong, obtuse . . . . . ." Is it a foreign species, or not a *Veronica?*

New York Botanical Garden.

AN ESTUARIAN VARIETY OF SCIRPUS SMITHII.

Norman C. Fassett

While examining material of *Scirpus Smithii* Gray, collected last August on the banks of the Cathance River at Bowdoinham, Maine, the writer found that all the individuals from that locality had achenes with a perianth of bristles which differed from those of var. *setosus* Fernald by their complete lack of barbs. Material from Back River Creek in Woolwich and from the Androscoggin River at Brunswick proved on examination to have similar smooth bristles about the achene. The length of the bristles, moreover, instead of being uniform and greater than that of the achenes, as in var. *setosus*, was variable even on the same achene, and while an occasional bristle exceeded it, this was not common, and there were no cases in which all the bristles exceeded the achene. The number of bristles was also

more variable, ranging from two to six, instead of from four to five as in var. *setosus*. The color of the achenes, running from almost black to almost white in *S. Smithii* and its variety with barbed bristles, darker toward the base of the spikelet (a matter, doubtless, of degree of maturity), in this case varied greatly, but seemed to average lighter than in the other forms of the species, the deep brown never reaching the almost ebony shades of the common types.

This condition of smooth-bristled varieties in the *Cyperaceae* frequently occurs, as for example in *Rynchospora capitellata* (Michx.) Vahl., var. *discutiens* (Clarke) Blake, and in *R. capillacea* Torr., var. *leviseta* E. J. Hill. *Eleocharis Engelmanni* Steud., var. *detonsa* Gray has the bristles absent, or when present smooth and reduced to mere rudiments, but they are variable and may even in some cases exceed the achene, in this variability being more closely parallel with the estuarian *Scirpus* than are the two Rynchosporas.

This new plant exhibiting these characters comes from a locality which has already produced some remarkable species.[1] Many of the rivers of Sagadahoc County have their mouths drowned twice a day by the rising tide, producing muddy estuaries. Merrymeeting Bay, a few miles above Bath, has no salt water, but has a strong tide which extends far up the five rivers which enter it, including the Kennebec, the Androscoggin, and the Cathance. Thus along their banks there is left uncovered twice a day a wide stretch of mud, upon which a rank vegetation flourishes. Then, when the muddy and somewhat brackish water is forced back by the rising tide, these flats are covered to a depth of several feet. Back River Creek, a stream which has a similar estuary on a much smaller scale, is separated from this system by a short stretch of salt water, but it is not surprising to find this little sedge there also. Indeed there is another estuarian plant which is apparently confined to these same localities: *Bidens Eatoni* Fernald, var. *kennebecensis* Fernald was collected at Cathance River and at Back River Creek by Professor Fernald and Mr. Bayard Long in 1916, and has not been observed anywhere else.

This new phase of *Scirpus Smithii* may well take the name of:

Scirpus Smithii Gray, var. **levisetus**, n. var., setis 2–6, levibus vel rare subscabris, 0.5–2 mm. longis, achenio castaneo plerumque brevioribus.

[1] See Rhodora **19**: 91. 1917.

The 2–6 bristles perfectly smooth or rarely slightly roughened, 0.5–2 mm. long, mostly shorter than the chestnut-brown achene.—MAINE: border of salt-marsh, Back River Creek, Woolwich, Sept. 15, 1916, *Fernald & Long*, no. 12830; tidal mud-flats of the Cathance River, Bowdoinham, Sept. 14 & 19, 1916. *Fernald & Long*, no. 12829; Brunswick, Aug. 6, 1894, *C. A. Davis;* muddy bank of the Androscoggin River, Brunswick, Sept. 15, 1904, *Kate Furbish;* tidal flats of the Cathance River at Bowdoinham and at its mouth in Merrymeeting Bay, Aug. 25–Sept. 2, 1920, *Fassett* (TYPE in Gray Herb.).

HARVARD UNIVERSITY.

EQUISETUM FLUVIATILE OR E. LIMOSUM?

M. L. FERNALD AND C. A. WEATHERBY.

FOR nearly fifty years before the publication, in 1893, of the *List of Pteridophyta and Spermatophyta of Northeastern North America*, the common horsetail of our marshes and river-shores was universally known to American botanists as *Equisetum limosum* L. In that work, the first attempt to apply the provisions of the American Code, the name *E. fluviatile* was substituted. This change was made because the species, as now and for more than a century understood, includes both *E. limosum* and *E. fluviatile* of Linnaeus and of the two names, published on the same page of the *Species Plantarum*, the latter has priority of position and had to be taken up under Canon 13 of the American Code. A. A. Eaton adopted it in his treatment of the North American Equiseta in the Fern Bulletin and in the seventh edition of Gray's *Manual;* and it is now nearly as generally used in America as was its predecessor twenty years ago. In Europe, however, the great majority of authors have retained *E. limosum*. This circumstance and the further fact that the International Rules do not admit priority of position in cases where two groups of the same rank, published at the same time, are united, but require the retention of that one of the two names chosen by the author who first suggests the union, raise the question whether, after all, *E. fluviatile* is the correct name.

In order to answer this question satisfactorily, it is necessary to consider in some detail the nomenclatorial history of the species. *E. fluviatile* first appears in the *Flora Lapponica*, 310 (1737). Its identity is fixed by the existence in Linnaeus' herbarium of a speci-

men in his possession in 1753 and labelled by him with the descriptive phrase assigned to *E. fluviatile* in the *Species Plantarum*.[1] To this Linnaeus added in the *Flora Suecica*, 305 (1745) another species, "Equisetum caule nudo laevi." He retained both in the *Species Plantarum*, giving to the latter the specific name *limosum*. This treatment seems to have been generally accepted by European authors for some thirty years, the name *fluviatile*, however, being often applied to *E. Telmateia* Ehrh., an error which Linnaeus had made possible by citing under *E. fluviatile* synonyms from Bauhin and Haller applicable to *E. Telmateia*. Ehrhart in 1783[2] clearly pointed out that *E. fluviatile* and *E. limosum* of Linnaeus were branched and unbranched forms of the same species and formally united them, unfortunately, however, giving to the aggregate the new and wholly needless name *E. Heleocharis*. Ehrhart's union of *E. limosum* and the real *E. fluviatile* has been accepted by the majority of authors since,[3] though the name *fluviatile* long continued to be applied in various works[4] to *E. Telmateia*. Roth in 1800 (Tent. Fl. Germ. iii. 9) correctly united the two under the name *E. limosum*, citing as synonyms *E. fluviatile* and *E. Heleocharis*, though, curiously, he took the branched form as typical and made a varietal name for the true typical form. A few authors, especially among the Scandinavians, have employed the name *E. fluviatile* for the united species, but G. F. W. Meyer, in 1836,[5] seems to have been the first formally to reduce *E. limosum* to varietal status under it.

It appears, then, that Roth was the first to unite *E. limosum* and *E. fluviatile* under a tenable name and that, according to the International Rules, the name which he chose, *E. limosum*, must stand.

As stated by Eaton[6] there appear to be no true varieties of this species in America. Its variants, though often striking in aspect, not only intergrade freely, but occur commonly in the same colonies throughout a similar range and sometimes even on the same rootstock. Meyer and Milde considered the simple and branched forms as seasonal states or due to the depth of water in which they happened

[1] Fide Vaucher, Monog. des Prêles, 45 (1822); Milde, Monog. Equiset. 256 (1865); Jackson, Index to the Linnean Herb. Proc. Linn. Soc., no. 124, Suppl. 72 (1912).

[2] Hannov. Mag. (1783), Stueck 18, 286, according to Roth, Beitr., ii. 158 (1788).

[3] See, for instance, Schkuhr, Krypt. Gew. t. 171 (1809) where both are figured on the same plate under the name *E. limosum*.

[4] Milde, Monog. Equiset. 257 (1865) gives a long list of them.

[5] Chloris Hanov. 668 (1836).

[6] Fern Bull., x. 73 (1902).

to grow: here, however, both may develop side by side. The plant here treated as f. *minus* seems at first sight to have varietal characters. But these characters re-appear in basal branches of typical *E. limosum;* and Eaton, in a note on one of the sheets in the herbarium of the New England Botanical Club, states that he has observed this form to be produced where a freshet had deposited sand on a bed of typical plants and that, after some years, it reverted to the typical form. It seems best, therefore, to consider it as a reduced ecological state of *E. limosum.*

The more striking forms, which seem to deserve some recognition, are given, with their synonymy, below.

Culms simple or merely with a few solitary or scattered, commonly long and strongly ascending branches.
  Culms stout, 3.5–7.5 mm. in diameter in dried material; sheaths of mature primary culms usually closely appressed, their linear-lanceolate teeth mostly over 2 mm. long and black for their whole length.....1. *E. limosum.*
  Culms slender, 1.5–3 mm. in diameter in dried material; sheaths usually rather loose, their teeth deltoid-lanceolate, mostly less than 2 mm. long and black only in the upper half.....2. f. *minus.*
Culms with definite whorls of 4–16 slender ascending or spreading branches from the median and upper nodes.
  Branches sterile.....3. f. *verticillatum.*
  Branches, or some of them, bearing strobiles at their apices.....4. f. *polystachium.*

1. Equisetum limosum L. Sp. Pl. 1062 (1753). *E. Heleocharis* Ehrh. Hannov. Mag. (1783) Stueck 18, 286, acc. to Roth, Beitr. ii. 158 (1788). *E. limosum* β. *aphyllum* Roth, Tent. Fl. Germ. iii. 9 (1800). *E. fluviatile,* "Spielart" a. *praecox* G. F. W. Mey. Chloris Hanov. 668 (1836). *E. fluviatile simplex* Rupr. Symb. 92 (1845). *E. fluviatile* limosum* Hartm. Skand. Fl. ed. 5, 216 (1849). *E. limosum* α. *genuinum* Gren. & Godr. Fl. Fr. iii. 644 (1855). *E. limosum,* f. *Linnaeanum* Doell, Fl. Baden, 64 (1857). *E. limosum,* var. *simplex* Milde, Gefaess-Crypt. Schlesiens, 448 (1858). *E. limosum,* var. *Linnaeanum* Milde, Monog. Equiset. 342 (1865). *E. fluviatile* β. *limosum* Hartm. Skand. Fl. ed. 11, 548 (1879). *E. Heleocharis,* f. *limosum* Klinge, Arch. Naturf. Soc. Dorpat, Ser. 2, viii. 410 (1882). *E. Heleocharis,* B. *limosum* Aschers. & Graebn. Syn. Mitteleur. Fl. i. 136 (1896).—Labrador to Alaska, so. to New York, Indiana, Illinois, Wyoming and Washington.

2. Forma minus A. Br. in Doell, Rhein. Fl. 30 (1843).[1] *E. uliginosum* Muhl. in Willd. Sp. Pl. v. 4 (1810). *E. limosum* β. *minus* A. Br. Am. Journ. Sci. xlvi. 86 (1844). *E. limosum,* var. *uliginosum* Milde, Monog. Equiset. 343 (1865). *E. Heleocharis,* f. *uliginosum*

[1] The form is here published without author citation as if it were Doell's own; but in the Fl. Baden he attributes it to Braun.

Klinge, Arch. Naturf. Soc. Dorpat, ser. 2, viii. 411 (1882). *E. Heleocharis*, B. *limosum*, f. *uliginosum* Aschers. & Graebn. Syn. Mitteleur. Fl. i. 136 (1896). *E. fluviatile*, var. *uliginosum* A. A. Eaton, Fern Bull. x. 73 (1902). *E. limosum*, f. *Linnaeana*, subf. *minor* Dalla Torre & Sarntheim, Fl. Tirol, vi. 74 (1906). *E. limosum* α. *Linnaeanum* sub-var. *minus* Rouy, Fl. Fr. xiv. 500 (1913).—MAINE: springy places, Ft. Kent, June 15, 1898, *Fernald*, no. 2191; gravelly river-bank, Ft. Fairfield, July 7, 1893, *Fernald*, no. 200; sandy shores, Grand Isle, June 20, 1898, *Fernald*, no. 2194; in an old well, Orono, July 6, 1892, *Fernald;* margin of river, Winn, July 10, 1916, *Fernald & Long*, no. 12,315. VERMONT: shore of Winooski River, alt. 270 ft., Essex Junction, 25 July, 1911, *Blake*, no. 2190. MASSACHUSETTS: sandy pools, Amesbury, May 30, 1897, *A. A. Eaton*, no. 47; June, 1902, *A. A. Eaton*, no. 48. ILLINOIS: Chicago, *N. L. T. Nelson*. YUKON: Dawson, June 19, 1914, *Eastwood*, no. 309. Muhlenberg's *E. uliginosum* came from Pennsylvania and Braun cites the form as collected in Newfoundland by La Pylaie.

3. Forma VERTICILLATUM Doell, Fl. Baden, 64 (1857). *E. fluviatile* L. Sp. Pl. 1062 (1753), excl. syn. Hall. and Bauhin. "Afart" *E. limosum fluviatile* Hornem. Dansk Oeconomik Plantelaere, 345 (1837). *E. limosum*, formae *brachycladon* and *leptocladon* Doell, Rhein. Fl. 30 (1843). *E. limosum* β. *ramosum* Gren. & Godr. Fl. Fr. iii. 644 (1855). *E. limosum*, vars. *verticillatum* and *attenuatum* Milde, Gefaess-Crypt. Schlesiens, 448 (1858). *E. Heleocharis*, 2 *fluviatile* Klinge, Arch. Naturf. Soc. Dorpat, ser. 2, viii. 412 (1882). *E. limosum*, "var. *E. fluviatile*" Baker, Handb. Fern Allies, 4 (1887). *E. Heleocharis*, A. *fluviatile* Aschers. & Graebn. Syn. Mitteleur. Fl. i. 135 (1896). *E. fluviatile*, var. *verticillatum* A. A. Eaton, Fern Bull. x. 73 (1902). *E. limosum*, f. *fluviatilis* (with subformae *brachyclada*, *leptoclada* and *attenuata*) Dalla Torre & Sarntheim, Fl. Tirol, vi. 74 (1906).—Newfoundland to the Yukon, so. to Delaware, Indiana, Wisconsin, Nebraska, Idaho and Oregon.

Although the earliest name in the formal category applied to this plant is f. *brachycladon* Doell, we have felt justified in taking up the earliest formal name applied to the group as we define it. F. *brachycladon* applies only to a single, short-branched phase of our form, hardly worth any recognition; the name, as indicating the contrast between the branched and unbranched forms, is so inappropriate as to be misleading; and it and its companion *leptocladon* were reduced by Doell himself in his Fl. Baden to sub-forms under his f. *verticillatum*. There seems no reason for upsetting his more mature and obviously correct treatment, which has been accepted by practically all subsequent authors.

E. fluviatile intermedium A. A. Eaton in Gilbert, List N. Am. Pterid. 8, 26 (1901) appears, from the scanty material at hand, to be only stunted f. *verticillatum*.

4. Forma POLYSTACHIUM (Brückn.) Doell, Fl. Baden, 65 (1857), where wrongly ascribed to Lejeune, Fl. Spa. ii. 274 (1813). *E. polystachium* Brückn. Fl. Neobrand. Prod. 63 (1803). *E. limosum polystachion* Seringe in Vaucher, Monog. des Prêles, 44 (1822). *E. limosum*, β. *Candelabrum* Hook. Fl. Bor.-Am. ii. 269 (1840). *E. limosum*, γ. *polystachyum* A. Br. Am. Journ. Sci. xlvi. 86 (1844). *E. Heleocharis*, f. *polystachyum* Klinge, Arch. Naturf. Soc. Dorpat, ser. 2, viii. 411 (1882). *E. Heleocharis*, *A. fluviatile*, f. *polystachyum* Aschers. & Graebn. Syn. Mitteleur. Fl. 136 (1896). *E. fluviatile*, var. *polystachyum* A. A. Eaton, Fern Bull. x. 74 (1902). *E. limosum*, f. *fluviatilis*, subf. *polystachya* Dalla Torre & Sarntheim, Fl. Tirol, 74 (1906).—Specimens have been seen from Nova Scotia, Maine and Michigan: there are reports from Manitoba (β. *Candelabrum* Hook.), Oregon (Am. Fern Journ. ix. 104) and Washington (Fern Bull. x. 74).

GRAY HERBARIUM.

HERBARIUM OF REV. W. P. ALCOTT.—On a recent visit to the Peabody Academy of Sciences in Salem I was much pleased to find there the entire herbarium of the late Rev. W. P. Alcott. This is a recent acquisition which is of great value. Mr. Alcott built up a general American collection of a few hundred sheets by collecting and exchange, and he had several other smaller collections from different parts of the world.

Most interesting of all to the local student is Mr. Alcott's collection of wool-waste plants, which he made during his pastorate at North Chelmsford, Massachusetts. There are many references to these plants in Dame & Collins's Flora of Middlesex County (1888). Now that this collection is accessible, practically all the citations in this Flora can be traced to actual specimens. Dr. C. W. Swan's herbarium at Yale University includes many of these Middlesex plants, and the others are in the Gray Herbarium or in that of the New England Botanical Club.—CLARENCE H. KNOWLTON, Hingham, Massachusetts.

AMELANCHIER AMABILIS, A NEW NAME. In the September number of this Journal (RHODORA, xxii. 149, 1920) the writer made the combination *A. grandiflora*. While the paper was in press the same name was proposed by Rehder (Journ. Arnold Arboretum, ii. 45, 1920) for a hybrid Amelanchier common in the Eastern United States. The name **A. amabilis** is, therefore, proposed to replace the name *A. grandiflora* antedated by the *A. grandiflora* of Rehder.—K. M. WIEGAND, Cornell University.

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JOURNAL OF

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THE GENUS ECHINOCHLOA IN NORTH AMERICA.

K. M. Wiegand.

In the seventeenth volume of this journal (Rhodora xvii. 105. 1915) Fernald showed that in eastern North America we have, in addition to *Echinochloa crusgalli* L. and the maritime *E. Walteri* (Pursh) Nash, another species, *E. muricata* (Michx.) Fernald. In the field the writer has noted other forms of *Echinochloa* which were not easily placed in any of the described categories. For this reason an investigation of the genus was attempted, the results of which are presented in the following pages. The study soon led into the warmer portions of America where the genus is well represented, and it was decided to include in the treatment all of the region north of Panama. Our knowledge of some of the forms, especially from the tropics, is as yet fragmentary, and more material will doubtless modify the ranges, and perhaps in some cases even the limits of species. This paper was nearly ready for the press when the recent revision of the genus *Echinochloa* by Hitchcock (Contr. U. S. Nat. Herb. xxii. pt. 3, 133–153. 1920) was received. The two treatments were found to differ so widely that the publication of the paper still seemed wise.

The species of *Echinochloa* do not fall into well-marked groups and almost every character that may be selected to define a group presents one or more exceptions, so that the construction of a key or synopsis has been extremely difficult; yet to one engaged in their study the ultimate species and forms seem well marked. Besides the size and form of spikelets and size and nature of the spinules, the length of the anther has been found of service in indicating relationship and in helping to establish boundaries between species.

In all, several hundred measurements have been made, and the constancy of size for each species and variety is remarkable. The measurements of anthers given in the key are all from herbarium material, and are probably somewhat smaller than would be those made from fresh material. The presence or absence of stamens in the lower floret seems to characterize a fundamental group of species, but the presence or absence of the palet of this floret, though generally reliable, breaks in two species, and is probably not of primary importance; also the presence of the ligule is apparently not fundamentally important as a group character, though valuable in separating species. The perennial or annual habit, on the contrary, seems to be more fundamental.

The following key is really a synopsis in key form of the species, varieties and forms of *Echinochloa* in North America. It is based on the material in the Gray Herbarium, Herbarium of the New England Botanical Club, Herbarium of the New York State College of Agriculture, and the Herbarium of Mr. F. Tracy Hubbard; also some types have been seen at the New York Botanical Garden. In the lists of specimens given in the text following the synopsis many specimens have been omitted in regions where the species is common.

a. First floret with or without a palet, neutral, very rarely staminate; lower glume inserted close to the upper or but slightly distant; ligule wanting or rarely a trace in *E. oplismenoides*, but ligular region sometimes pubescent; plant glabrous except in *E. Walteri*, annual, in low or upland soils.

b. Spikelets 4.5 mm. long or less, ellipsoid, ovoid or oval, from scarcely echinate to very strongly and coarsely so.

c. Upper glume not awned, except rarely in *E. muricata;* lower lemma awned or awnless; spikelets ellipsoid or ovoid; anthers 0.3–1 mm. long.

d. Spikelets ovoid or oval, approaching ellipsoid in varieties of *E. zelayensis;* coriaceous lemma ovate or oval.

e. Coriaceous lemma subacute or obtuse, the tip withering; spikelets moderately echinate to almost unarmed, never appearing very bristly to the unaided eye.

f. Panicle narrow, usually open; branches short, 1–2.5, rarely 4 cm. long, slender, usually simple, the small (2–2.9 mm. long), oval, unarmed, often obtuse, scarcely echinate spikelets in few rows; leaf-blades 3–6 mm. broad; (coriaceous lemma obtuse; anthers 0.7–0.8(–0.9) mm. long; lower palet present; branch- and nodal hairs of the panicle usually poorly developed; low slender grasses).

g. Leaves entirely green.....1. *E. colonum.*
g. Leaves cross-banded with purple.....forma *zonalis.*
f. Panicle broader, often ovoid, open or dense; branches longer (2–6, rarely –9 cm. long), usually compound and usually more densely flowered; spikelets larger, 2.5–4 mm. long, ovoid or oval, obtuse to strongly acute or awned, echinate or unarmed; leaf-blades 5–30 mm. broad.
g. Coriaceous lemma subacute; spinules minute and almost uniform in size or wanting; lower palet often wanting; anthers 0.7–1 mm. long; nodal and branch-setae of the panicle much reduced or wanting (spinules scarcely swollen at base).
h. Spikelets 3.3–4 mm. long, 1.7–2 mm. broad, awnless, soft-tipped; coriaceous lemma 2.7–3 mm. long.....2. *E. zelayensis.*
h. Spikelets 2.5–3 mm. long, 1.1–1.5 mm. broad, sometimes awned; coriaceous lemma 1.9–2.5 mm. long.
i. Spikelets awnless, soft-tipped.....var. *macera.*
i. Spikelets or some of them short-awned.....var. *subaristata.*
g. Coriaceous lemma in most spikelets obtuse; spinules if present more strongly developed on the sides of the spikelet or on the lower lemma; lower palet present; anthers 0.6–0.85 mm. long; nodal and branch-setae usually well developed; (spikelets 2.8–3.7 mm. long, 1.5–2.3 mm. broad).
h. Spikelets with very short inconspicuous—mostly slender-based spinules, or these nearly wanting, subglabrous, broad and turgid, mostly obtuse and soft-tipped, awnless; lower palet almost always purple; panicle dense, chocolate-purple, the branches often incurved at apex; leaves in well-developed specimens 15–25 mm. broad.....3. *E. frumentacea.*
h. Spikelets with numerous spinules of medium length, the lateral usually with swollen bases, less turgid, strongly apiculate, firmer-tipped; lower palet whitish; panicle usually rather open, with straight spreading branches, green or purple; leaves 15 mm. broad or less.
i. Awns none, or a few spikelets with short awns.....4. *E. crusgalli.*
i. Awns prominent, longer, many or all of the spikelets awn-bearing.....forma *longiseta.*
e. Coriaceous lemma subacuminate, the tip firmer; spikelets from moderately to very strongly echinate, often appearing very hispid even to the unaided eye; (branch- and nodal setae usually poorly developed).
f. Spikelets large, 3.3–4.5 mm. long, 1.8–2.2 mm. broad; anthers 0.7–0.8(–0.9) mm. long.

g. Spinules numerous, very coarse and bristly; some spikelets awned; panicle open or moderately dense.....5. *E. muricata.*

g. Spinules few, short and inconspicuous; spikelets awnless; panicle usually dense. var. *ludoviciana.*

f. Spikelets small or medium (2.5) 2.8–3.4 mm. long, rarely longer in var. *multiflora* due to the long point, 1.4–1.8 mm. broad; anthers (0.3) 0.4–0.7 mm. long; (spikelets awnless or with short awn-tips; panicle normally rather dense).

g. Spinules not very bristly, slightly swollen at base, the dorsal ones of the upper glume minute or none; panicle green or purple-tinged; (anthers 0.5 (0.4–0.6) mm. long).....var. *occidentalis.*

g. Spinules long, coarse and bristly, strongly swollen at base, the dorsal well developed, spreading; panicle usually dark violet-purple or the albinos green.

h. Spikelets apiculate or short-acuminate, very rarely subulate-tipped; panicle dense, 7–20 cm. long; anthers 0.3–0.5 (–0.6) mm. long.....var. *microstachya.*

h. Spikelets long-acuminate, often subulate-tipped; panicle longer and looser, (9–)15–40 cm. long; anthers 0.6–0.7 mm. long.....var. *multiflora.*

d. Spikelets ellipsoid or broadly ellipsoid, more densely aggregated; coriaceous lemma elliptical; (spikelets with short purple awns or rarely almost awnless; spinules mostly uniform in size on the various ribs, slender, ascending, scarcely swollen at base; lower palet present; coriaceous lemma subacute; nodal and branch-setae of the panicle moderately developed).

e. Spikelets 2.8–3.2 mm. long; anthers 0.6 (0.5–0.8) mm. long.....6. *E. echinata.*

e. Spikelets 3.5 mm. long; anthers 1–1.2 mm. long. var. *decipiens.*

c. Upper glume short-awned, very rarely awnless (see also sometimes *E. muricata*); lower lemma with a long purple awn; spikelets ellipsoid; anthers 0.9–1 (0.6–1.2) mm. long; (spikelets softly but plainly echinate; spinules equally developed on the various ribs or stronger on the lateral; coriaceous lemma elliptical, subacute; lower palet present; panicle broad, dense, usually purple, nodding; the nodal and branch-setae well developed).

d. Sheaths papillose-hispid and pubescent.....7. *E. Walteri.*

d. Sheaths glabrous.....forma *laevigata.*

b. Spikelets 4.7–6 mm. long, ellipsoid, slightly or not at all echinate, the spinules fine; (lower glume broad subtruncate-acute; upper glume acuminate or awn-tipped; lower lemma short-awned; lower palet present or absent; anthers 0.6–0.8 mm. long; panicle narrow, with or without nodal and branch-setae). 8. *E. oplismenoides.*

a. First floret without a palet, neutral; lower glume distant from the upper, narrow; ligule a row of hairs; coarse glabrous perennial plants of wet places; (spikelets large, 6–8 mm. long, ellipsoid not turgid, very minutely echinate or unarmed, short-awned, upper glume often awn-pointed; awn of lemma (1–)2–4 cm. long; panicle usually large, broad and dense, with copious nodal and branch-setae; anthers 1.1–1.4 mm. long). 9. *E. holciformis.*

a. First floret with a palet, staminate; lower glume inserted close to the upper; ligule a row of hairs or wanting; coarse glabrous or hairy perennial plants of wet places; (spikelets ovoid or elliptic-ovoid, the ribs all nearly equally and finely echinate; awn of lemma short or none; panicle large but rather narrow).

b. Ligule a line of hairs.

c. Spikelets 4.8–6 mm. long, short-awned; coriaceous lemma 4–5 mm. long; anthers 2 mm. long; nodal and branch-setae of the panicle usually copious; leaf-blades 15–25 mm. broad; sheaths usually hairy; nodes densely hairy.....10. *E. polystachya.*

c. Spikelets 3–3.8 mm. long, awnless or nearly so; coriaceous lemma 2.5–3 mm. long; anthers 1 mm. long; nodal and branch-setae moderately developed; leaf-blades 5–10 mm. broad; sheaths and nodes glabrous.....11. *E. guadeloupensis.*

b. Ligule wanting, but ligular region often pubescent; (anthers 1–1.5 mm. long; spikelets short-awned or awnless; branches of panicle with few or no setae; nodal hairs medium; leaf blades 8–30 mm. broad; nodes and sheaths glabrous).

c. Spikelets 3.5–3.8 mm. long, 1.8–2 mm. broad, green. 12. *E. paludigena.*

c. Spikelets 2.8–3.5 mm. long, 1.4–1.5 mm. broad, usually purple-tinged; branches of the panicle less densely flowered.....var. *soluta.*

1. E. COLONUM (L.) Link,[1] Hort. Berol. ii. 209 (1833). *Panicum colonum* L. Syst. ed. 10. 870 (1759).—A weedy grass in damp cultivated fields and waste places: South Carolina, Tennessee and Arkansas to Florida, Texas and southern California, also in Mexico, Central America and the West Indies; almost cosmopolitan in the warmer countries; sporadic in the northeastern states (Charlotte, Vermont, *Pringle;* Philadelphia, *Parker*).

Forma **zonalis** (Guss.) comb. nov. *Panicum zonale* Guss. Fl. Sic. Prod. i. 82 (1827). *P. colonum*, var. *zonale* L. H. Dewey, Contr. U. S. Nat. Herb. ii. 502 (1894). *Echinochloa zonalis* Parl. Fl. Panorm. i. 119 (1839).—Leaves cross-banded with purple. Massachusetts, Texas, Arizona, and probably elsewhere. Specimens examined: MASSACHUSETTS: Amherst, "ornamental," 1875, *W. H. Blanchard.* TEXAS: about Kerrville, 1894, *A. A. Heller*, no. 1,923. ARIZONA: Chiricahua Mountains, 1907, *J. C. Blumer*, no. 2,268.

[1] Hitchcock, following Greene, has called attention to the fact that the name *colonum* is not an adjective and hence should not be declined (see Mex. Grasses, Contr. U. S. Nat. Herb. xvii. pt. 3, 256, 1913).

E. colonum is generally smaller and narrower-leaved than other species of the genus. It varies slightly in size and bluntness of the spikelets, and in extent of overlapping of the slender branches of the panicle, but is on the whole a clearly marked species.

2. E. ZELAYENSIS (HBK.) Schult. Mant. ii. 269 (1824). *Oplismenus zelayensis* HBK. Nov. Gen. et Sp. 89 (1815). *E. crusgalli zelayensis* Hitchc., U. S. Dept. Agr. Bull. 772, 238 (1920).—Damp, sandy soil, Texas, Oklahoma, Kansas and southern California, southward through Mexico. Northern specimens examined were: TEXAS: San Elizario, *Bigelow;* Big Springs, 1902, *S. M. Tracy*, no. 8,291. OKLAHOMA: Olustee, 1913, *G. W. Stevens*, no. 1,178; Hopeton, 1913, *Stevens*, no. 1,691. KANSAS: Grant County, 1895, *A. S. Hitchcock*, no. 573. NEW MEXICO: Mesilla, 1897, *E. O. Wooton*, no. 36. ARIZONA: Ft. Yuma, *Major Thomas;* Mule Mountains, 1910, *L. N. Goodding*, no. 926. CALIFORNIA: New River near Rockwood, Salton Basin, 1912, *S. B. Parish*, no. 8,240; Colorado Valley, *J. G. Cooper*, no. 2,227.

Var. **macera** var. nov., spiculis minoribus 2.5–3 mm. longis, 1.5 mm. latis, lemmatibus coriaceis 1.9–2.5 mm. longis.—Western Texas to southern California and northern Mexico. TEXAS: western Texas, *Berlandier*, no. 1,009; Waco, 1916, *J. A. Minier*. CALIFORNIA: Tulare County, 1892, *E. Palmer*, no. 2,713; Talma Valley, *Heerman*. MEXICO: Matamoros, 1831, *Berlandier*, no. 890 (TYPE in Gray Herb.).

Var. **subaristata** var. nov., spiculis minoribus 2.5–3 mm. longis, 1.5 mm. latis nonullis spiculis breviaristatis.—Western Texas. TEXAS: Pierce, 1901, *S. M. Tracy*, no. 7,743 (TYPE in Gray Herb.); from western Texas to El Paso, 1849, *C. Wright*, no. 794.

The var. *macera* is clearly but a small form of *E. zelayensis* with all the features of that species represented in miniature. The var. *subaristata* has less the appearance of *E. zelayensis*, but the absence of the lower palet and certain general resemblances would seem to place it here. Possibly, when more material is at hand, this variety may prove to be a distinct species. In all of the specimens of *E. zelayensis* and its varieties from the United States the lower palet was absent. This was the case in only about one-third of those from Mexico and Central America, including the var. *macera*.

3. E. FRUMENTACEA (Roxb.) Link, Hort. Berol. i. 204 (1827). *Panicum frumentaceum* Roxb. Hort. Beng. 7 (1814). *E. crusgalli edulis* Hitchc. U. S. Dept. Agr. Bull. 772, 238 (1920).—Widely cultivated in the United States and southern Canada as Japanese or Barnyard Millet, or Billion-dollar Grass; native of southeastern Asia. *E. crusgalli* and *E. frumentacea* represent a group of Old World forms characterized by the blunt coriaceous lemma and well-developed setae of the panicle.

4. E. CRUSGALLI (L.) Beauv. Agrost. 53 (1812). *Panicum crus-galli* L. Sp. Pl., ed. i. 83 (1753). *P. crusgalli, α brevisetum* Döll, Fl. Baden, i. 232 (1857).—Introduced by roadsides and in waste places through the eastern United States and Canada, and sparingly westward; native of Europe. A few of the specimens examined were: PRINCE EDWARD ISLAND: Southport, 1912, *Fernald, Long & St. John*, no. 6,824. NEW BRUNSWICK: Shediac Cape, 1916, *F. T. Hubbard*, nos. 755 & 763 (type collection of forma *vittata* Hubbard). NOVA SCOTIA: Sable Island, 1913, *H. St. John*, no. 1,131. MAINE: North Berwick, 1891 & 1894, *J. C. Parlin*. NEW HAMPSHIRE: Jaffrey, 1898, *B. L. Robinson*, no. 566. VERMONT: Manchester, 1898, *M. A. Day*, no. 272. RHODE ISLAND: Old Harbor, Block Island, 1913, *Fernald, Long & Torrey*, no. 8,664. CONNECTICUT: Southington, 1898, *L. Andrews*, no. 622. NEW YORK: Canton, 1914, *O. P. Phelps*, no. 175; Cayuga Lake Basin, *E. L. Palmer*, no. 93, *F. P. Metcalf*, no. 5,567, *A. J. Eames*, no. 9,171, *Eames & Wiegand*, no. 11,255. ONTARIO: Ottawa, 1894, *J. Macoun;* Plevna, 1902, *J. Fowler*. IOWA: Iowa City, 1889, *A. S. Hitchcock;* Ames, *C. R. Ball*, no. 146. IDAHO: Boise, 1911, *J. A. Clark*, no. 308. CALIFORNIA: Redding, 1914, *L. E. Smith*, no. 745. OREGON: John Day Ferry, 1894, *J. B. Leiberg*, no. 872.

Forma LONGISETA (Trin.) Farwell, Rep. Mich. Acad. Sci. xxi. 349 (1919). *Panicum cruris-galli*, var. *longisetum* Trin. Sp. Gramin. ii. t. 162 (1829). *E. crusgalli*, var. *aristata* S. F. Gray, Nat. Arr. Brit. Pl. ii. 158 (1821).—Scattered throughout the range of the species and in similar situations, but perhaps proportionally more frequent westward; introduced from Europe. Some specimens studied were: MAINE: East Livermore, 1878, *K. Furbish*. NEW HAMPSHIRE: Haverhill, 1917, *M. L. Fernald*, no. 15,499, transitional. MASSACHUSETTS: Arlington, 1913, *Long & St. John*, no. 8,665; Kelly's Pond, Dennis, 1918, *Fernald & Long*, no. 16,180. NEW YORK: western New York, 1830–33, *A. Gray*, transitional; Cayuga Lake Basin, *E. L. Palmer*, no. 94, *F. P. Metcalf*, nos. 1,570 & 5,568, *Eames & Wiegand*, nos. 11,258, 11,259 & 11,260, *Eames, Randolph & Wiegand*, no. 11,257. ONTARIO: Toronto, 1905, *Wm. Scott*. NEBRASKA: Ewing, 1898, *J. M. Bates*. NEVADA: Wadsworth, 1902, *Griffiths & Hunter*, no. 549. OREGON: Salem, 1917, *J. C. Nelson*, no. 1,811. BERMUDA ISLANDS: Devonshire Marsh, 1914, *Brown, Britton & Bisset*, no. 1,961.

In the first edition of the Species Plantarum Linnaeus published *Panicum crusgalli*, giving as a description: "spicis alternis conjugatisque, spiculis subdivisis, glumis aristatis hispidis. Habitat in Europae, Virginiae cultis. Variat aristis, in aliis longitudine glumarum, in aliis decies longioribus." He also proposed a var. β, giving the following quotation from Bauhin (Pinax 8) as the sole description: "gramen paniceum, spica divisa, aristis longis armata."

Very little that is definite can be derived from the extended synonomy given by Linnaeus under his α except the reference to the Hortus Cliffortianus. There another reference leads to Morison (Hist. iii. p. 189 & sect. 8, t. 4, f. 15), where the figure is plainly an awnless form of *Echinochloa*, and it is said to grow: "ad agrorum & vinearum margines in hortis item & viridariis, nullo satu, apud Germanos, Italos & Gallos, rarius in Anglia, reperitur." The Bauhin reference under β gives no indication that his long-awned form came from America, neither does the reference in Lobelius which Bauhin cites. Morison also described and figured a long-awned variety (l. c. fig. 16), giving the same reference to Lobelius as did Bauhin. The locality given by Morison for this variety was: "Gramen praecedens (*i. e.*, the short-awned) frequenter ut in Tritico, Lolio." It is therefore evident that both a short-awned and a long-awned European form of the barnyard grass were known to Linnaeus. Hitchcock in his "Types of American Grasses" (Contr. U. S. Nat. Herb. xii. pt. 3, 117, 1908) argues that certain American specimens must be considered types of Linnaeus' α and β. The type of α, he says, is determined by a specimen in the Linnean herbarium bearing the mark "K," which agrees with the description, and is the only specimen to which Linnaeus attached the name *Panicum crusgalli*. Fastened to the Kalm sheet, Hitchcock says, are two other sheets, both from Gronovius, one of which is a large-panicled short-awned form, which seems to be the same as the plant cited by Gronovius as Clayton's no. 591; and the other a long-awned form with hispid sheaths, which is now called *E. Walteri*, and to which he says was probably due Linnaeus' statement "in Virginiae cultis" and his conception of *P. crusgalli* var. β. However, if it be considered that Linnaeus must have known well the common barnyard grass of Europe, that his reference under both α and β refer to European material, and that his only mention of America was founded on a long-awned plant which would fall under his var. β, we are scarcely warranted in taking this Kalm specimen, apparently incidentally labelled *Panicum crusgalli*, as the type of a species which Linnaeus himself said grows in Europe. Neither is it necessary to consider the long-awned Virginian plant as the type of Linnaeus' var. β, as he very probably confused this plant with the long-awned plant of Europe already known to him, and this confusion very likely gave rise to the accidental insertion of "Virginiae cultis"

in the original account. There is no good reason for considering the var. β of Linnaeus as other than the long-awned form of Europe.

This long-awned form of Europe, which Linnaeus noted but did not name and which is now introduced widely in North America, was first named *Echinochloa crusgalli* var. *aristata* by S. F. Gray and later *Panicum crusgalli* var. *longisetum* by Trinius, but the latter name was used by Farwell, who was the first to treat the plant as a form. Trinius' variety was founded on both American and Caucasian material, but the latter only was figured. He said that it differed from *Panicum crusgalli* solely in the elongated awns, and the figure would seem to bear this out. His plant was certainly not the *P. echinatum* Willd. as some authors have stated. Whether Pursh's *Panicum crusgalli* α *aristatum* (Fl. Am. Sept. 66, 1814) is this form or *E. muricata* it is impossible to say. A variegated form of *E. crusgalli* has been described by F. T. Hubbard as forma *vittata* (Rhodora xviii. 232, 1916).

5. E. muricata (Michx.) Fernald, Rhodora xvii. 106 (1915). *Panicum muricatum* Michx. Fl. Bor. Am. i. 47 (1803). *E. crusgalli* var. *muricata* Farwell, Rep. Mich. Acad. Sci. xxi. 350 (1919). Illustration: Hitchcock, Contr. U. S. Nat. Herb. xxii. pt. 3, fig. 30 (1920). Native in low grounds, mostly on gravelly or sandy shores; Maine to Florida and westward to Illinois, Kansas, Oklahoma and New Mexico. The following are among the specimens examined: Maine: Woolwich, 1916, *Fernald & Long*, no. 12,565; Limington, 1916, *Fernald, Long & Norton*, no. 12,564. New Hampshire: Derry, 1916, *C. F. Batchelder*. Massachusetts: Gloucester, 1913, *Fernald, Hunnewell & Long*, no. 8,672; Lakeville, 1913, *Fernald & Long*, no. 8,668; Orleans, 1918, *Fernald & Weatherby*, no. 16,177. Rhode Island: Great Salt Pond, Block Island, 1913, *Fernald, Long & Torrey*, no. 8,674; Crescent Beach, Block Island, 1913, *Fernald & Long*, no. 8,667. Connecticut: Berlin, 1900, *J. N. Bishop*. New York: Staten Island, 1917, *A. Gershoy*, no. 761; Cayuga Lake Basin, *Eames & Wiegand*, no. 11,270, *Wiegand*, no. 11,271, *E. L. Palmer*, nos. 95 & 96, *F. P. Metcalf*, nos. 1,571 & 5,569. New Jersey: Atlantic County, 1895, *F. L. Scribner*. District of Columbia: B. & O. R. R. tracks, 1904, *A. H. Moore*. Maryland: Great Falls, 1915, *T. Holm*. West Virginia: Sweet Springs, 1903, *E. S. & Mrs. Steele*, no. 210; near Harman, 1904, *J. M. Greenman*, no. 52; Huttonsville, 1904, *A. H. Moore*, no. 2,456. North Carolina: Biltmore, 1897, *Biltmore Herb.*, no. 809a. Georgia: Lafayette, 1900, *R. M. Harper*, no. 343. Florida: Apalachicola, *Biltmore Herb.*, no. 809b. Illinois: White Heath, 1912, *A. S. Pease*, no. 14,090; Makanda, 1902, *H. A. Gleason*, no. 2,170. Missouri: White-

side, 1911, *J. Davis*, no. 1,017. Oklahoma: near Miami, 1913, *G. W. Stevens*, no. 2,265. Kansas: Riley County, 1895, *J. B. Norton*, nos. 574 & 884b. New Mexico: 1847, *A. Fendler*, no. 995.

Var. **ludoviciana** var. nov., spiculis muticis 3.5 mm. longis, 1.8–2.2 mm. latis sparse et tenuiter strigosis vel subglabratis, spinulis parvis, gluma superiore nervo medio plerumque inechinata.—Sandy river banks; Louisiana to New Mexico. Louisiana: without locality, *Hale;* New Orleans, old specimen without collector's name; Baton Rouge, 1903, *F. H. Billings*, no. 14 (type in Gray Herb.). New Mexico: Kingston, 1904, *O. B. Metcalf*, no. 1,351.

Var. **occidentalis** var. nov., spiculis brevi-apiculatis 2.8–3.3 mm. longis, 1.5–1.7 mm. latis strigosa-hispidis, spinulis in spiculis brevibus vel subbrevibus mollibus paulum vel non omnino basi tumidis eis in lemmate inferiore exceptis, spinulis in nervo medio glumae superioris parvis absentibusve.—Waste places and open grounds in damp, rich soil; Maine and New Hampshire to southeastern Massachusetts and Rhode Island, also Illinois to Washington and southward to Missouri and New Mexico. Some specimens examined were: Maine: Milford, 1916, *Fernald & Long*, no. 12,568; South LaGrange, 1916, *Fernald & Long*, no. 12,567. New Hampshire: Randolph, 1908, *A. S. Pease*, no. 11,684; Jefferson, *Pease*, no. 16,870. Massachusetts: West Cambridge, *Pease*, no. 11,400; Harwich, *Fernald & Long*, no. 16,176; Worthington, 1912, *B. L. Robinson*, no. 613. Rhode Island: Block Island, 1913, *Fernald & Long*, nos. 8,675 & 8,666. Illinois: Champaign, 1900, *H. A. Gleason*, no. 1,930; Grand Tower, *Gleason*, no. 1,720 (type in Gray Herb.). Wisconsin: Marinette County, 1894, *J. H. Schuette*. Missouri: Aberdeen, 1911, *J. Davis*, no. 945; Kansas City, 1918, *B. F. Bush*, no. 8,821. Oklahoma: Longdale, 1913, *G. W. Stevens*, no. 813. North Dakota: Leeds, 1899, *J. Lunell*. South Dakota: Deadwood, 1913, *W. P. Carr*, no. 153. Iowa: Mount Pleasant, 1894, *J. H. Mills*. Nebraska: Middle Loup River near Mullen, 1893, *P. A. Rydberg*, no. 1,590. Kansas: Riley County, 1896, *J. B. Norton*, no. 884. Idaho: New Plymouth, 1910, *J. F. Macbride*, no. 713. Wyoming: Cummins, 1895, *A. Nelson*, no. 1,500. Colorado: Salida, 1892, *A. I. Mulford*, no. 104. New Mexico: Fort Bayard Watershed, 1905, *J. C. Blumer*, no. 136. Arizona: Walnut Cañon, 1898, *D. T. MacDougal*, no. 353; horseshoe bend of the Colorado River, 1889, *E. Palmer*, nos. 749 & 750. Nevada: northwest Nevada, 1867, *W. W. Bailey*, no. 1,351. California: Napa Creek, 1866, *Bolander*, no. 2,419; north of Oroville, 1914, *A. A. Heller*, no. 11,418. Oregon: Hayden Island, 1917, *J. C. Nelson*, no. 1,974; Wasco County, 1894, *J. B. Leiberg*, no. 866. Washington: Waitsburgh, 1897, *R. M. Horner*, nos. R265–B527.

Var. **microstachya** var. nov., spiculis 3–3.2 mm. longis, 1.4–1.8 mm. latis crasse echinatis, spinulis numerosis firmis plus minusve divaricatis basi tumidis, spiculis igitur facie valde hispidis, gluma

superiore echinato item in nervo medio.—Native in low, rich ground along river banks and in other open grassy places, often in clay; Maine, Rhode Island and Connecticut westward through Ontario, New York, Wisconsin and Illinois to South Dakota, Wyoming, Texas, Arizona, northern Mexico and the West Indies. Some specimens examined were as follows: MAINE: Woolwich, 1916, *Fernald & Long*, no. 12,566. VERMONT: Manchester, 1903, *W. H. Blanchard*, no. 22. MASSACHUSETTS: Boston, 1916, *F. S. Collins*, no. 3,717. CONNECTICUT: Pomfret, 1916, *C. A. Weatherby*, no. 4,034. NEW YORK: Oneida, 1906, *H. D. House*, no. 2,776; Cayuga Lake Basin, *Dean & Eames*, no. 3,489, *E. L. Palmer*, no. 97 (TYPE in Gray Herb.), *Wiegand*, no. 11,268, *Eames, Randolph & Wiegand*, nos. 11,261, 11,265, 11,267 & 11,268, *F. P. Metcalf*, no. 5,570. ONTARIO: Galt, 1908, *W. Herriot*. ILLINOIS: Waukegan, 1906, *Gleason & Shobe*, no. 320. MICHIGAN: Alma, 1895, *C. A. Davis*. WISCONSIN: Milwaukee, *J. A. Lapham*. MINNESOTA: Ft. Snelling, 1891, *E. A. Mearns*, no. 39. SOUTH DAKOTA: Huron, 1897, *D. Griffiths*, no. 773. UTAH: Murray, 1916, *F. T. Hubbard*, no. 21. COLORADO: Dry Creek, Larimer County, 1900, *A. Nelson*, no. 8,207; Denver, 1891, *E. L. Hughes*, no. 38. NEW MEXICO: near Pecos, 1908, *P. C. Standley*, no. 5,016. ARIZONA: Wilgus Ranch, Chiricahua Mountains, 1907, *J. C. Blumer*, no. 1,782; Ft. Verde, 1891, *D. T. MacDougal*, no. 614. MEXICO: between Colonia Garcia and Pratt's Ranch below Pacheco, Chihuahua, 1899, *E. W. Nelson*, no. 6,244. WEST INDIES: St. Thomas, *Eggers*.

Var. **multiflora** var. nov., paniculis amplissimis, in statu elato ad 35 cm. longis elliptico-ovoideis sublaxis, spiculis 3–3.5 mm. longis, 1.5 mm. latis acuminatissimis copiose submuricato-hispidis, spinulis subtenuibus longitudine mediocribus, gluma superiore nervo medio rare et brevissime spinulato, lemmate coriaceo acuminatissimo.—Oklahoma and Kansas to northern Mexico. OKLAHOMA: Lincoln County, 1895, *J. W. Blankenship* (TYPE in Gray Herb.). KANSAS: Solomon River, 1894, *C. L. Shear*, no. 169; Riley County, 1896, *J. B. Norton*, no. 884a. TEXAS: western Texas to El Paso, 1849, *C. Wright*, no. 796. NEW MEXICO: 1852, *C. Wright*, no. 2,089. MEXICO: Chihuahua State, 1885, *E. Palmer*, no. 18, not typical; Santiago Papasquiaro, Durango, 1896, *E. Palmer*, no. 466.

In the first copy of this manuscript, *E. muricata* and the varieties *ludoviciana, occidentalis, microstachya* and *multiflora* were all treated as separate species. In reality, however, the differentiating characters were mainly those of general appearance. Moreover, though sufficiently distinct locally, the material from other regions generally intergraded between the various proposed species. Thus, while the eastern var. *microstachya* was distinct from var. *occidentalis* and from typical *E. muricata*, the western var. *microstachya* tended to

bridge over the gap between these forms. It has seemed wise, therefore, to proceed for the present on a conservative basis, and treat these forms as varieties of a common stock. *E. muricata* in this broad sense is a well-defined unit characterized by the acute coriaceous lemma, short nodal hairs and the general reduction or absence of branch-setae.

The var. *ludoviciana*, when well developed, differs from the typical form of *E. muricata* in the muticous spikelets, great reduction of spicules and dense inflorescence. The var. *occidentalis* is the less bristly, often awn-pointed extreme of the small-spikeleted *microstachya* type. Var. *microstachya* is densely bristly as is the typical form of the species, but the spikelets are smaller and more generally muticous, and the color of the panicle is usually dark chocolate-brown. The var. *multiflora* resembles var. *microstachya* but the panicle is larger and more open, and the spikelets more acuminate and slightly less bristly. The anthers vary slightly through the different varieties, though they are remarkably constant for each variety. The smallest anthers are those of var. *microstachya* and the largest those of typical *E. muricata*. The anthers of var. *microstachya* are indeed the smallest in the genus. Some specimens of the typical form of the species from Georgia and Florida have awned upper glumes. It will be noted that in general the variations of *E. muricata* are geographical. Whether Pursh's names *Panicum crusgalli* β *mite* and γ *purpureum* apply to forms of this species or to variations of *E. crusgalli* cannot now be determined.

6. E. ECHINATA (Willd.) Beauv. Agrost. 53 (1812). *Panicum echinatum* Willd. Enum. Pl. Berol. 1032 (1809). *Oplismenus crus-pavonis* HBK. Gen. et Sp. i. 88 (1815). *E. sabulicola* Hitchc., Contr. U. S. Nat. Herb. xvii. pt. 3, 257 (1913), probably not *Panicum sabulicolum* Nees. Agrost. Brasil. 258 (1829). *E. crusgalli crus-pavonis* Hitchcock, Contr. U. S. Nat. Herb. xxii. pt. 3, 148 (1920).—Mexico through Central America to northern South America and Brazil. MEXICO: Saltillo, Coahuila, 1898, *E. Palmer*, no. 418; Durango, 1896, *E. Palmer*, no. 730; Guadalajara, Jalisco, 1896, *E. Palmer*, no. 430A; Orosco, Jalisco, 1910, *A. S. Hitchcock*, no. 7,373; Queretaro, 1910, *A. S. Hitchcock*, no. 5,866; Valley of Mexico, 1901, *C. G. Pringle*, nos. 8,572 & 9,606; Orizaba, *Botteri*, no. 718. GUATEMALA: Coban, Alta Verapaz, 1887, *H. von Tuerckheim*, no. 1,287. PANAMA: Chagres, 1850, *A. Fendler*, no. 365.

Var. **decipiens** var. nov., spiculis longioribus 3.5 mm. longis, antheris longioribus 1 mm. longis.—Central Mexico: Etzatlan,

Jalisco, 1903, *E. W. D. Holway*, no. 5,096; Zamora, Michoacan, 1901, *C. G. Pringle*, no. 8,480 (TYPE in Gray Herb.).

This plant is provisionally appended to *E. echinata* as a variety, with which species it is most closely related, and from which it differs in characters of degree only. A wider range of specimens may show it to be a distinct species. Pringle's no. 8,480 was listed by Hitchcock under *E. oplismenoides*.

In 1809 Willdenow (Enum. Pl. Berol. 1032) published *Panicum echinatum*, the description containing the statement: " . . . glumis aristatis muricato echinatis. . . . Habitat in America meridionale." It was similar to *P. crusgalli*, he says, but "minus et valvulis muricato-echinatis." He gave as a synonym *P. muricatum* Hornem., Cat. Hort. Haf., p. 28, but the writer has not had access to the Horneman reference. There are very few species of *Echinochloa* in Central America, and only the present species agrees at all closely with Willdenow's description. Although several authors have refused to take up the name *echinatum* and others have treated it in widely different ways, its application to this species seems sufficiently clear to warrant its acceptance. Judging from the description, the *Oplismenus crus-pavonis* HBK. can be no other than the present species. The *Panicum sabulicolum* Nees. is more questionable. It was described from sandy ground in Para, and from Montevideo and Paraguay. The last two regions and possibly the first are outside the range of *E. echinata* as known to the writer. The author recognized it in addition to *P. crus-pavonis* which he made a synonym of *P. echinatum* Willd., moreover his description does not fit our species very well. Trinius seems to have figured as *Panicum sabulicolum* (Gram. ii. no. 163, 1829) a specimen of *E. echinata*, and a somewhat similar confusion seems to exist in Döll's treatment (in Mart. Fl. Brasil. ii. pt. 2, 142, 1842). Kunth (Enum. Plant. i. 145, 1833) made *P. sabulicolum* a synonym of *P. echinatum*, but separated it from *P. crus-pavonis*. It is possible that Nees had in hand some member of this genus not included in the present study, material of which is not available.

7. E. WALTERI (Pursh) Nash[1] in Britton's Manual 78 (1901). *Panicum Walteri* Pursh, Fl. Amer. Sept. i. 66 (1814), not Muhl.

[1] Heller in his Cat. N. A. Plants, ed. 2, 21 (1900) listed *E. Walteri* (Pursh) but with no description or synonymy. Notwithstanding that Pursh's name is in parenthesis, the reference is too vague to warrant the acceptance of this as a valid publication of the combination.

or Ell. *P. hispidum* Muhl. Gram. 105 (1817). *P. crusgalli*, var. *hispidum* Ell. Fl. S. C. & Ga. i. 114 (1821).—Brackish marshes along the coast from New Hampshire to Florida, Texas and the West Indies, also inland about the Great Lakes, apparently absent from Mexico and Central America. Inland specimens studied were as follows: New York: Ithaca, 1913, *E. L. Palmer*, no. 98, 1914, *Wiegand*, no. 1,572, 1916, *Eames & Metcalf*, no. 5,571. Ohio: St. Marys, 1900, *A. Wetzstein* in Kneucker Gram. Exsic., no. 75; Bay Point, 1914, *MacDaniels & Eames*, no. 289. Indiana: Little Chapman Lake, Kosciusko County, *C. C. Deam*, no. 21,975. Illinois: Calumet Lake, Chicago, 1900, *Agnes Chase*, no. 1,426. Wisconsin: 1861, *T. J. Hale*.

Forma **laevigata** forma nov. *Panicum longisetum* Torr., Amer. Jour. Sci. iv. 58 (1822). *E. longearistata* Nash in Small's Fl. S. E. U. S., 84 (1903).—Vaginis glabris. Massachusetts to Illinois and Arkansas (South Carolina to Louisiana, *Nash*). Massachusetts: West Barnstable, 1916, *St. John & Hunnewell;* Chilmark, 1894, *S. Harris*. New York: Oswegatchie River at DeKalb, 1915, *O. P. Phelps*, no. 1,107. Illinois: Fox River, 1821 (type of *Panicum longisetum* Torr. in Herb. Columb. Univ.). Arkansas (?): *Hale* (type of *E. longearistata* Nash in Herb. Columb. Univ.). The specific names of Torrey and Nash would be so inappropriate if used for this form that a new name has been selected.

8. E. oplismenoides (Fourn.) Hitchcock, Contr. U. S. Nat. Herb. xxii. pt. 3, 136 (1920). *Berchtoldia oplismenoides* Fournier, Mex. Pl. ii. 41 (1886).—Low grounds; northern Mexico to Guatemala. Specimens examined were: Mexico: Cananea, Sonora, 1910, *Ricketts;* Sierra Madre, Chihuahua, 1887, *C. G. Pringle*, no. 1,404; Durango, 1896, *E. Palmer*, no. 253 in part; 1910, *A. S. Hitchcock*, no. 7,616; Toluca, Mexico, 1910, *Hitchcock*, no. 6,914. Guatemala: Estanzuela, Santa Rosa, 1892, *Heyde & Lux* in exsic. J. D. Smith, no. 3,911.

This plant resembles *E. holciformis* superficially and was at first placed by the writer with that species; but the narrow panicle, approximate, broader and more obtuse lower glume, general absence of a ligule, shorter anthers, and annual habit render it abundantly distinct. In about one-half of the specimens the lower palet was absent, and in one specimen some spikelets possessed the palet while others did not. No spikelets were found with the lower floret staminate as mentioned by Fournier.

9. E. holciformis (HBK.) Chase, Proc. Biol. Soc. Wash. xxiv. 155 (1911). *Oplismenus holciformis* HBK. Nov. Gen. et Sp. i. 88 (1815).—Ditches and swamps, Central Mexico to Central America. Mexico: Lower California near Guadalupe, 1865–66, *Bourgeau*, no. 910; Durango, 1896, *E. Palmer*, no. 253; Acambaro, Guanajuato,

1910, *A. S. Hitchcock*, no. 6,946; Valley of Mexico, 1901, *C. G. Pringle*, no. 8,622; near Morelia, Michoacan, 1909, *G. Arsène*, no. 3,079.

10. E. POLYSTACHYA (HBK.) Hitchcock, Contr. U. S. Nat. Herb. xxii. pt. 3, 135 (1920). *Oplismenus polystachyus* HBK. Nov. Gen. et Sp. i. 88 (1815).[1] *Panicum spectabile* Nees, Agrost. Brasil. 262 (1829). *P. aristatum* Macfad. in Hooker's Bot. Misc. ii. 115 (1831). *Oplismenus jamaicensis* Kunth, Enum. Pl. i. 147 (1833).—Swamps and ditches, Mexico (Hitchcock), the West Indies and northern South America to Argentina (Hitchcock).

Whether the name *Oplismenus polystachyus* HBK. applies to this species is not entirely clear. Certain characters mentioned in the original description, as lower flower male, glumes hispid, first lemma ovate, paleas two, and ligule pilose, leave no doubt that it belongs to some member of this group of species. However, the foliage is described as glabrous, but the writer has seen no specimens with glabrous foliage. Until the accumulation of more material has shown that the name belongs to some seggregate of the present species, it would seem wise to retain the name for the group rather than the next later name, *E. spectabilis* (Nees) Link. From the description, *Panicum aristatum* Macfad. would clearly seem to be this species, though Hitchcock states that the type specimen is *E. crusgalli crus-pavonis*, which is our *E. echinata*. In Macfadyen's description the ligule is said to be a line of long hairs, the sheaths ciliato-setose, the culms geniculate at base, 4–5 ft. high, and the leaves a foot long, broad, linear and hispid.

11. E. **guadeloupensis** (Hackel) comb. nov. *Panicum spectabile* var. *guadeloupense* Hackel, Notizbl. Bot. Gart. Berlin, i. 328 (1897). *E. pyramidalis* Hitchcock & Chase, Contr. U. S. Nat. Herb. xviii. pt. 7, 345 (1917) and Hitchc., *ibid.* pt. 3, 134 (1920), not *P. pyramidale* Lam., Tab. Encyc. i. 171 (1791) and Encyc. iv. 735, misprinted 745 (1796).—Island of Guadeloupe: *P. Duss*, no. 3,920 (Hackel's type specimen was *Duss*, no. 3,176).

Hitchcock and Chase (l. c.) credit *E. pyramidalis* (Lam.) Hitchc. & Chase to Guadeloupe as introduced from Africa, the type station being Senegal, and say that it is the same as *Panicum spectabile* var. *guadeloupensis* Hackel, which was based on a collection made in Guadeloupe by Duss. However they do not state on what ground it is assumed to have been introduced. There is in the Gray Herbarium a specimen of *Echinochloa* from Guadeloupe collected by

[1] The first volume of Humboldt's work in the library of Cornell University bears the date 1815, and the above species is described on p. 88, not on p. 107 in 1816 as frequently cited.

Duss (no. 3920) which agrees with Hackel's description. There is also a specimen from Senegal labelled *Panicum pyramidale.* Both specimens have a hairy ligule. This in the case of the Guadeloupe plant, together with certain other rather remote resemblances, may have led Hackel to place this form with *P. spectabile.* The Senegal specimen resembles the one from Guadeloupe superficially, but does not agree with Lamarck's original description of *P. pyramidale* where he says "fleurs . . . glabres ou presque glabres," it having plainly echinate spikelets. Kunth says of *P. pyramidale* that it is related to *P. plicatum* Willd., which is a true *Panicum* and not an *Echinochloa.* However, the Senegal plant differs from the Guadeloupe plant in two important particulars: it has distinctly larger spikelets (4.5–5 mm. long as opposed to 3.5 mm. long), and much larger anthers (1.5–2 mm. long as opposed to 1 mm. long). In these respects the Senegal plant approaches *E. polystachya* (*E. spectabilis*). Since the Guadeloupe plant is apparently distinct from *E. pyramidalis* and also from other American members of the genus, it should be treated as a species, using the varietal name of Hackel.

12. E. **paludigena** sp. nov., robusta vel tenuis plerumque decumbens glabra, foliis 8–25 mm. latis, ligulis nullis, zona ligulari plerumque pubescenti, paniculis viridibus 10–45 cm. longis angustis lanceolatis apertis, pilis ex nodis subbrevibus, ramis adscendentibus 1.5–7 cm. longis simplicibus vel subsimplicibus sparse vel omnino non setosis, ramis inferioribus distantibus, spiculis mediocribus 3.5–3.8 mm. longis, 1.8–2 mm. latis late elliptico-ovoideis acutis sparse strigosis, nervis copiose echinatis, spinulis mediocribus vel longis tenuibus adscendentibus basi subtumidis, spiculis igitur facie inhispidis, flore inferiore masculino, gluma inferiore acuminata plus minusve echinata, gluma superiore in nervis omnibus echinata, lemmate inferiore plerumque breviaristato, arista 2–8 mm. longa, lemmate coriaceo 2.5–3 mm. longo ovato acuto, paleis duabus, antheris 1–1.4 mm. longis.—Swamps, southern Florida: Hillsborough County, 1904, *A. Fredholm,* no. 6,390 (TYPE in Gray Herb.); Miami, 1904, *S. M. Tracy,* no. 9,399; Cutler, 1904, *A. A. Eaton,* no. 959.

Var. **soluta** var. nov., paniculis purpureo-variegatis, spiculis anguste ovoideis vel ellipticis 2.8–3 mm. longis, 1.4–1.5 mm. latis subacuminatis, lemmate coriaceo elliptico subacuto 2.5 mm. longo.—Swamps, southern Florida: Everglades, Lee County, 1905, *A. A. Eaton,* no. 1,314; Myers, 1900, *A. S. Hitchcock,* no. 476; Manatee, 1901, *S. M. Tracy,* no. 7,754 (TYPE in Gray Herb.).

This species is most closely related to *E. polystachya* and *E. guadeloupensis,* differing from them primarily in the absence of a ligule.

From *E. polystachya* it differs also in the smaller anthers and glabrous foliage. The var. *soluta* differs from the typical form mainly in the more purple narrower spikelets, but at times has the aspect of a distinct species.

Cornell University, Ithaca, New York.

ADDITIONS TO THE FLORA OF MOUNT DESERT, MAINE.

Wm. Randolph Taylor.

The appearance in 1894 of a Flora of Mount Desert, Maine, by E. L. Rand and J. H. Redfield marked the culmination of the efforts of several enthusiastic naturalists to make a complete botanical survey of the island. This very valuable list was soon followed by a series of reports of the discovery of additional species. These were mostly phanerogams reported in Rhodora by Mr. Rand, but lesser extensions of the other groups of plants have also been made. In 1908 the Josselyn Botanical Society of Maine held a summer meeting at the village of Manset, and later published a list of the plants noted in the neighborhood.[1] It has become increasingly evident that the island, due to its position, conformation and geological history, supports an exceedingly varied and interesting flora. Because of its unique character it seems advantageous to extend the list of plants known to occur there as rapidly as possible. This is especially so now that we have a very accurate list from the islands just southwest of the Mount Desert group, a Flora of the Penobscot Bay Region by Albert F. Hill, with which a comparison of the Flora of Mount Desert shows many interesting similarities.[2]

The writer, in the company of Dr. J. M. Macfarlane, spent a large part of the summer of 1915 on the island, and returned for a part of the summer of 1920, on both occasions making Manset the headquarters for botanical work. A considerable number of additional forms were found, as well as new localities for plants reported in the Rand and Redfield Flora as rare. The following list is presented of material collected by Dr. Macfarlane and the writer in 1915, and by the latter alone in 1920. With great kindness Miss Annie Lorenz

[1] Bulletin of the Josselyn Botanical Society of Maine, No. **2**: 1–23. 1908.
[2] Proceedings of the Portland Society of Natural History **3**: 199–304. 1919.

permitted the inclusion of her collection data for such unreported hepatics as she had found, and which had later been independently detected by the writer. Samples of these were sent to her for determination. Previous to his last visit Miss Lorenz spent part of two summers in the collection and study of the hepatics of the island, a full report on which will appear in due time. It will be seen that the list is not one of little known forms, but rather of plants elsewhere familiar, which due to local scarcity or other causes, have escaped observation here. Several fresh-water algae are included since a few were admitted to the Rand and Redfield Flora, but the total of species reported represents but a small fraction of the probable number present on the island. Determinations were wherever practicable verified by comparison with identified material from a dependable source, or by the kindness of Dr. Marshall A. Howe, Mr. Stewardson Brown and Mr. George B. Kaiser, to whom certain specimens were submitted and to whom the writer is much indebted for assistance. For literature on Maine plants he must thank Mr. Arthur H. Norton. Specimens are to be found in the herbaria of the University of Pennsylvania (U. P.) and the writer (T.).

Mougeotia genuflexa (Dillw.) Ag. Lower Hadlock Pond, Sept. 1920 (T. 3125).

Botryococcus Braunii Kütz.[3] Echo Lake, Aug., 1920.

Tetraspora lubrica (Roth) Ag. Stream in woods, between Lower Hadlock Pond and Northeast Harbor, Sept., 1920 (T. 3131).

Chlorococcum humicola (Naeg.) Rabenh. Ice Pond, Manset, Aug., 1920 (T. 3119).

Codiolum petrocelidis Kck. Seawall, among filaments of *Petrocelis*, Aug., 1920 (T. 3128).

Zoochlorella parasitica Brandt. In *Ophrydium*, Ice Pond, Manset, Sept., 1920 (T. 3120).

Ankistrodesmus falcatus (Corda) Ralfs. Pool in an old cellar, abundant, Manset, Sept., 1920 (T. 3118). Associated with this were the following four species:

Kirchneriella contorta (Schmindle) Bohlin. Scarce.

Scenedesmus dimorphus (Turpin) Kütz. Abundant.

Scenedesmus abundans brevicauda G. M. Smith. Very scarce.

Scenedesmus quadricauda parvus G. M. Smith. Scarce.

[3] Identification based on living material, not abundant enough for preparation of an herbarium specimen.

Dictyosphaerium pulchellum Wood.[3] Echo Lake, Aug., 1920.

Monostroma undulatum Farlowii Foslie. Seawall, tide pools, very scarce, Aug., 1920 (T. 3204).

Chaetosphaeridium Pringsheimii Klebahn.[3] On *Oedogonium sp.*, Echo Lake, Aug., 1920.

Draparnaldia glomerata (Vauch.) Ag. In a spring, southwest part of the island; exact locality lost, 1915 (T. 3363).

Herposteiron vermiculoides (Wolle) Collins. On *Oedogonium sp.* Echo Lake, southern end east of Canada Brook, Aug., 1920 (T. 3127).

Nitella tenuissima (Desv.) Coss. & Germ. Southern end of Echo Lake on a sandy bottom, Sept., 1915, seen again, 1920 (T. 1531).

Botrydium granulatum (L.) Grev. Manset, shore of Ice Pond, Aug., 1920 (T. 3117).

Under the name *Lithothamnion polymorphum* L., F. S. Collins includes in the Mount Desert Flora forms which probably are to be recognized as distinct from the *Lithothamnion polymorphum* of Linnaeus. Of these were collected:

Lithothamnion glaciale Kjellm. Seawall tide pools, Sept., 1920 (T. 3205).

Lithothamnion compactum Kjellm. (= *Phymatolithon compactum* (Kjellm.) Foslie. Seawall tide pools, Sept., 1920 (T. 3206).

Riccardia pinguis (L.) S. F. Gray. Upper Hadlock Pond, July, 1920, Lorenz. On twigs and humus, cedar swamp on trail between Manset and Bass Harbor, Aug., 1920, Taylor (U. P. 71003, T. 3246).

Riccardia latifrons Lindb. Roberts Meadow, July, 1919, Cranberry Heath, July, 1920, Lorenz. On twigs and humus, cedar swamp on trail between Manset and Bass Harbor, Aug., 1920, Taylor (T. 3243).

Blasia pusilla L. Seal Cove Road near Southwest Harbor, on the sides of a ditch, Aug., 1920 (T. 3248).

Fossombronia foveolata Lindb. Jordan and Bubbles Ponds, July, 1920, Lorenz, Muddy shore of Ice Pond, Manset, Aug., 1920. Taylor (U. P. 71002, T. 3275).

Chiloscyphus fragilis (Roth.) Schiffn. Hunter Brook, July, 1919, Stanley Brook, July, 1920, Lorenz. Cedar swamp on trail between Manset and Bass Harbor, Aug., 1920 (U. P. 65193, T. 3273).

Fissidens cristatus Wils. Between the Hadlock Ponds, Sept., 1920 (U. P. 71000, T. 3343).

Orthotrichum sordidum Sull. & Lesq. Trees, Manset, Aug., 1920, Southwest Harbor, Sept., 1920 (U. P. 65866, T. 3397, 3315).

Mnium affine ciliare (Grev.) C. Mueller. Cedar swamp on trail between Manset and Bass Harbor, Aug., 1920. Perhaps in the Rand and Redfield list included under the name of *Mnium affine* Bland. (U. P. 40016, T. 3292).

Mnium punctatum elatum Schimp. Lower Hadlock Pond, Sept., 1920, and West side of Beech Mountain, Aug., 1920 (U. P. 65738, T. 3290, 3289).

Aulacomnium androgynum (L.) Schwaegr. Trail between Manset and Bass Harbor, on dead twigs, Aug., 1920 (U. P. 71008, T. 3311).

Thuidium abietinum (L.) Br. and Sch. Summit of Flying Mountain, Sept., 1920 (U. P. 65990, T. 3339).

Habenaria lacera (Michx.) R. Br. Wet meadow, Fernald Cove Road, Aug., 1915. Collected in 1914 by Dr. Macfarlane, and again in 1915, when accompanied by the writer (U. P. 64843, T. 1275).

Habenaria psycodes (L.) Sw. Marshy edge of woods, inland from Ship Harbor, Sept., 1915. This species was reported by W. H. Dunbar but Rand and Redfield reject the record, which lacked locality, considering that a small form of *Habenaria fimbriata* (Ait.) R. Br. was mistaken for this species. The material from near Ship Harbor, however, is quite typical (U. P. 67559, T. 1274).

Salix pentandra L. Roadside, Northeast Harbor, probably escaped from cultivation, Aug., 1915 (U. P. 67564, T. 1373).

Vicia angustifolia segetalis (Thuillier) Koch. Roadside in woods, Southwest Harbor, Aug., 1915 (T. 1311, 1312).

Linum catharticum L. Roadside, Seawall Point. This interesting little plant was quite abundant at this station in Aug., 1915, and seemed to be in a thriving condition when revisited in 1920 (U. P. 67522, T. 1430).

University of Pennsylvania.

AN INTERESTING HABITAT.

Donald C. Peattie.

It is not uncommon to see in hilly or more frequently in mountainous countries a special type of plant habitat which though of considerable botanical interest and sufficiently common and beautiful to attract general notice, has nevertheless been very little treated in scientific works.

This peculiar condition consists in a face or precipice of rock with frequently a sloping shelf below, and a continual seepage of water across the upper rock down on to the lower one. This is an essentially hydrophytic habitat, yet it is an aerial one too. Rock-loving and crevice-loving plants are at home here, and their foliage and often the long strands of their roots hang down the walls of the cliff. We are apt however to think of plants upon cliffs as xerophytes, and indeed they usually are. Lichens, certain saxifragacious plants, and such ferns as Cheilanthes and Polypodium come to mind. However, in the situations such as we have been describing, it is rather the hydrophytic or semi-hydrophytic plants which we find. For this particular combination of physical conditions of plant growth, one might propose the name Grotto, owing to the resemblance to the popularly so-called physiographic feature.

Grottoes are local though not rare, and may be found wherever there has been erosion into glens, and where there are abundant springs. The writer is familiar with them in the southern Appalachian system, and they are said to be common in the limestone mountains of Vermont and in the Laurentian Highlands. In the Middle West they are frequent in those pretty canyons cut into the limestones and sandstones of Indiana, Kentucky, Ohio and other states.

Grottoes may be seen in all stages of what we may term their conquest by plants. First of all we have merely the naked rock, or as they term it in the South, the "slick rock." By "slick" is meant a rock which is smooth, steep, and dripping with water. In the next stage the water has brought algae with it and these plants may be seen as pale green stripes upon the face of the cliff. Later mosses and liverworts lodge in the crevices, and soon they will take possession of the shelving ledge below. The Bryophytes will at length so mat the surface with their roots and break the force of the

water that the sediment gathers about them and they offer firmer hold for the higher plants. Sometimes, however, at least one species of the higher plants is the first of living things to make an appearance on the cliff. This may be a Saxifraga or a Chrysosplenium, and these rock-loving, water-loving plants are often seen with only algae to accompany them. Ferns and perennial herbs follow in due course.

A certain grotto in a mature state is well known to the writer. It is located in the Blue Ridge near the town of Melrose, North Carolina. Here in a deep mountain glen where the shade is heaviest, a spring seeps over a concave rock and supplies to the shelving ledge below, with its plant inhabitants, the continually fine drip of water which semi-aquatic plants find so favorable to their growth. It simulates, or rather it surpasses in effectiveness, the conditions in flower gardens where a continuous spray of cool water is maintained and where the soil is almost pure vegetable decay.

Here every inch of the room is contended for by every sort of plant—alga, moss, liverwort, fern, and flowering perennial. The cascade itself is tamed by the extensive root-system above to a gentle series of rivulets which run down the tangled masses of the algae. The algae in this case seem more like lianes or other aerial plants than those of ponds and pools. Such luxuriant Bryophytes as Fegatella, Catherinea, and numerous species of Mnium, have matted the shelf rock all over and to a remarkable depth. Most interesting of all is a marchantiaceous plant which, like the algae, hangs suspended from the upper rock and serves to conduct the rivulets of the seepage. It is a species of Dumortiera, and being immersed in water, unlike so many others of its tribe, it has lost the air chambers characteristic of the thallus of the Hepaticae. Only rudiments of these organs remain, and the thin translucent emerald-green of the long thallus makes it look more like a delicate seaweed such as Ulva. Seen through the clear water of a mountain stream, with the afternoon sunlight shining through it, or through the crystals of ice in winter, it is one of the most beautiful of plants.

The annual cycle of this grotto is interesting. Observed in winter, it is seen to be hung with icicles and still quite green with mosses and liverworts. There are few algae to be seen. The big basal rosettes of saxifragacious plants and the dead stalks of the summer's perennials show themselves, and the grass-green leathery thallus of

Fegatella runs over the grotto. But little else is visible save a Christmas fern strayed in by some accident and unhappy in its wet habitat.

But in March the small bright white blossoms and pinnatifid foliage of *Cardamine parviflora* L. may be seen, soon to be followed by the white *Saxifraga virginiensis* Michx. The fronds of the maidenhair fern uncoil. Then comes the handsome *Saxifraga micranthidifolia* L., growing up in a stalky and succulent way from its big reddish-green rosette of lettuce-like leaves which may at all seasons be observed in clumps all over the grotto. *Chrysosplenium americanum* Schwein. is another plant of which the small but extensive stem and foliage system may be seen throughout the moss covering. In May or in April, *Trillium grandiflorum* (Michx.) Schott. comes into its handsome flower and foliage, followed by *Trillium erectum* L. A very beautiful meadow rue, *Thalictrum clavatum* DC. comes in late spring. By summer the advent of dense shade of the trees overhead precludes the flowering of many species. In June, however, *Astilbe biternata* (Vent.) Britton and *Cimcifuga americana* Michx. raise their high stems and dainty foliage. A sterile species of Carex with very long basal leaves is especially noticeable in the niches of the rock.

The description of the grotto which has just been detailed is not a generality which could be applied to all grottoes. In different soils and climates the plants would differ. Even in the neighborhood of the particular grotto which has been mentioned, there are other rocks supporting such interesting elements as *Ranunculus sceleratus* L., *R. septentrionalis* Poir., *Thalictrum dioicum* L., *Mitella diphylla* L., *Stellaria pubera* Michx., *Cardamine Clematitis* Shuttlw. and often small shrubs of *Evonymus americanus* L., lodge in the crevices. In the Northern states grottoes are often a favorite hunting ground for arctic-alpine plants which extend their ranges southward along such cold wet cliffs.

Harvard University

An extended Range for Amelanchier amabilis.—Professor K. M. Wiegand in his "Additional Notes on Amelanchier" published recently in Rhodora, xxii. 146, in speaking of the range of his *Amelanchier grandiflora* says: "Its range as far as known at present, is from central and western New York to Ontario." Last summer

while at Cooperstown, Ostego County, New York, which is only about one hundred miles west of Albany, I collected a shadbush which at the time I supposed was *Amelanchier sanguinea* (Pursh) DC. This specimen was later sent to Professor Wiegand, who identified it as *A. grandiflora*. In returning it he wrote me as follows "One specimen in particular is interesting to me as it extends the range of the species farther east than heretofore known, this is *A. grandiflora* from Otsego County. There is no reason why this species should not occur throughout the limestone belt of New York eastward quite to Albany, but it has not yet been reported before east of Ithaca." I have just learned that Prof. Wiegand's name *A. grandiflora* while in press was anticipated by a homonym published a few days earlier, and that he has since chosen the name *A. amabilis* as a substitute.—Francis Welles Hunnewell, Wellesley, Massachusetts.

The date of the February issue (unpublished as this goes to press) will be annouced later.

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NOTES ON NEW ENGLAND ORCHIDS,— I. SPIRANTHES.

Oakes Ames.

(Plates 127–129)

Spiranthes, as limited in the most recent monograph of the Spiranthеæ,[1] includes only those species that are characterized by a spiral arrangement of the flowers. Thus limited, the genus attains its highest development in the United States. It is the only large amphigean orchid genus in our flora that has a preponderance of its recognized representatives in the range covered by Gray's New Manual, Small's Flora of the Southeastern United States and floras devoted to the vegetation of our western coast.

Among the twenty-four genera proposed as components of the Spirantheæ, the genus Spiranthes is set apart by the spiral arrangement of flowers in which the lateral sepals are free to the base and not decurrent on the ovary and in which the short column is characterized by a bent tip and an abbreviated foot. With the exception of Spiranthes, the genera of the Spirantheæ are confined to the New World. Whether or not we can permanently exclude from Spiranthes such species as *Spiranthes cranichoides* Cogn. now referred to Cyclopogon, and *Spiranthes eriophora* Robins. & Greenm. now referred to Schiedeella, is a debatable question.

Spiranthes is the most perplexing orchid genus in our flora. It is the least understood and the one that furnishes to authors who grow impatient under the restraints imposed by cautious progress, the best

[1] R. Schlechter in Beihefte zum Bot. Centralbl. XXXVII (1920), Abt. II, 318–454.

opportunities for the multiplication of species. It is a genus that repays intensive observation in the field and prolonged contemplation in the herbarium.

Taken throughout its range Spiranthes, as now limited, includes not less than twenty-two species. Of this number twelve are natives of the United States and Canada. Of extra-limital species only one has been reported from the mainland of South America. Three species are found in Europe, one of these, *Spiranthes Romanzoffiana* Cham., being also a native of the northern United States. Several are natives of the vast area included in Asia, Malaya, Australia and New Zealand. As to the validity of some of the Asiatic species, there is a difference of opinion and the final treatment of several of these may result in the recognition of a single polymorphic species with an extraordinarily wide distribution.

In the range covered by Gray's Manual there are three species that frequently present difficulties when a sure diagnosis is attempted. These are *S. cernua* L. C. Rich., *S. odorata* Lindl., and *S. vernalis* Engel. & Gray. *Spiranthes cernua* is so variable that attempts are sometimes made to discover in it a polymorphic species susceptible of splitting. It is difficult, without microscopical examination, to distinguish it from the variety *ochroleuca* Ames. Sometimes it is identified as *S. odorata*. It would seem that *S. odorata* owes its success in escaping synonymy to the fact that it was born under authority and subsequently sustained because efforts to recognize it have persisted. I am convinced that *S. odorata* is conspecific with *S. cernua*.[1]

Spiranthes cernua seems to exhibit a surprising range of variation and sometimes attempts are made to segregate new species from it. These result, I believe, from a misunderstanding of the life history of the species. In my opinion, the range of variation exhibited represents different stages of development. The seeds of this species are ripe and ready for dissemination shortly after the flowering period. If the seeds fall in favorable ground and mycorrhizal fungi, presum-

[1] J. K. Small refers *Spiranthes odorata* Lindl., *Gyrostachys ochroleuca* Rydb. and *Gyrostachys constricta* Small to *Ibidium cernuum* (L.) House, *Fl. Southeastern U. S.*, ed. 2 (1913) 320. The use of the generic name Ibidium is contrary to the international rules governing botanical nomenclature and should be dropped. It is in the list of *nomina relicienda* and is also excluded by Article 37 of the international rules of botanical nomenclature adopted at Vienna in 1905. There is no sanction for the use of Ibidium as a generic name other than that found in obstinate adherence to provincial practice.

ably essential to germination, are present, growth begins in the following season. The protocorm stage is soon reached and by autumn one or more leaves and a slender root have been produced. In the next growing season the little plants, if conditions are favorable, form their first flowers. These are borne in slender few-flowered racemes that represent a stage of development and not a permanent characteristic. The root-system now begins to increase and in the next growing season is sufficiently strong to support an elongated many-flowered raceme. Among the plants that represent any one of these stages of development normal variation may be expected, this depending to a large extent on the favorable or unfavorable influences that have prevailed. If, with these remarks in mind, we regard the Spiranthes population of any given area, the apparent variation is at once explained and no longer awakens a feeling of uncertainty as to the specific limitations imposed by conservative opinion.

It should be remembered that most orchids, at least most of those of which we know the stages of development, rarely produce flowers until after the vegetative system has become well established. The genus Cordula, for example, a genus allied to our native genus Cypripedium, produces strong growths of leaves and roots before the first flower is formed. Under ordinary conditions there is very little variation after the first flower is produced if the plants are under similar and favorable influences. If variations occur they are truly varietal, in a horticultural sense, and, as in the case of *Cordula insignis* var. *Sanderæ*, may be perpetuated by self fertilization. *Spiranthes cernua*, so far as I have observed it, is one of the exceptions to this rule and in each flowering season presents a different habital and floral aspect until the limit of vigor of the vegetative system is attained. If proof of this is desired it is only necessary to dig up the roots. In young plants these will be found very slender and few in number. In very slender plants with abbreviated few-flowered racemes it is not unusual to find a single root, this representing the first root developed from the protocorm of the preceding year. In vigorous plants with many-flowered racemes the roots will be found stout and numerous and will furnish conclusive evidence of the fact that the plants have attained a development representative of several years' growth. Although I have been unable to study *S. gracilis* from the earliest seedling stages, my observations lead me to believe that it is comparable to *S. cernua* in its development and that the

wide range of variation in size is due to the same phenomena that govern in the case of *S. cernua*.

In another paper of this series I shall show that *Pogonia verticillata* (Willd.) Nutt. (*Isotria verticillata* Raf.) in its seedling stages develops, in its first or second season of growth, a very weak root-system and only three leaves, and that this species probably requires a long preparatory period before the plants are strong enough to produce their first flowers. It is on this basis that we may explain the general similarity among the flowering plants of a colony of this Pogonia when compared with a colony of *Spiranthes cernua* in which a striking dissimilarity is apparent in floral and vegetative characters. We do not find here a succession of flowers produced during the early stages of development of the plants. Variations, if they occur, must be explained as the result of unusually favorable or unfavorable conditions affecting a plant here and there, or as the breaking down of specific characters, because in this case we are in the presence of a species that attains vegetative maturity before it begins to form its flowers.

The most favorable time to study the seedling stages of Spiranthes is in the summer and autumn when the different species are flowering. The reason for this is explained by the tendency of the seeds to germinate near mature plants. It would seem that the mycorrhizal fungus usually associated with *S. cernua* and perhaps essential to its development, is in abundance near established plants and ready to infect fertile seeds. The parent plants also serve as a guide to the places where seedlings may be sought for with success. Careful search will sometimes reveal hundreds of young plants in many stages of early development from the protocorm, devoid of root or leaf, to seedlings with a well developed root and one or more leaves. In an area less than a meter square I have found literally hundreds of seedlings, some of the smallest with the first leaf just forming and the protocorm resting in loose humus surrounded by cobweb-like hairs. In this stage of development sections of the protocorm exhibit a very thrifty condition of the mycorrhizal fungus which fills the cortical cells surrounding the vascular system.

Although it is highly probable that Spiranthes, like most of the other orchid genera that have been studied, depends on mycorrhiza for successful development, it is interesting to note that mature plants of *Spiranthes cernua* L. C. Rich., *S. gracilis* Beck, and *S.*

Beckii Lindl. are provided with roots that at flowering time are free from mycorrhizal fungi except for a small area at the base of the stem. Cross sections of the roots at any point a few millimeters below the base of the stem will be found simply filled with an abundance of food material. This accounts, perhaps, for the failure of at least one observer to find fungal hyphae in the root of *S. Beckii*.[1] In the study of the roots of Spiranthes in connection with mycorrhiza it is best to make longitudinal sections, as cross sections are likely to be inconclusive. From a study of these longitudinal sections it would seem that certain areas of the root have the capacity to repel the advance of the fungus and that in this respect the roots of Spiranthes are comparable to the bulbous thickenings of certain species of the Ophrydeae studied by Nöel Bernard.[2] It is as if there were some

Figs 1–4. Three stages of development in the seedlings of *Spiranthes cernua*. 1. Protocorm and two leaves before the formation of the first root (×3). 2. A more advanced stage before formation of a root (×2). 3. A young plant with the protocorm still present and the first root developing (×1½). All as found in September growing within a few inches of each other and apparently seedlings of equal size. 4. Seed of *Spiranthes cernua* var. *ochroleuca* (highly magnified).

fungicidal capacity in the cells of the root-structure that restricts the fungus to a limited area. Or, we may have, in the case of Spiranthes, an example of those plants that are able to defend themselves against an intrusive fungus by means of a digestive process that protects tissues of vital importance. In other words, there are two types of cells in the root-system, one type characterized by a capacity to digest the fungus and hold it in check, the other type, found in infected regions, characterized by the capacity to act symbiotically with the invading fungus.

[1] T. Holm, Am. Journ. Sci. xviii (1904) 205.
[2] Annales des Sciences Naturelles Botanique, xiv (1911) 222–234.

I have referred above to the difficulties experienced in distinguishing *Spiranthes cernua* from the variety *ochroleuca*. Sometimes plants that grow in upland meadows or in woodlands are arbitrarily referred to the variety while the plants of boggy ground are referred to the species. If a more reliable guide to differentiation is asked for we find few collectors who are able to give it. There is only one sure guide that I have found satisfactory, namely, polyembryonic seeds for the species and normal seeds for the variety. This distinction holds good in New England, at least, and may prove generally applicable. Usually a raceme in which the three lowermost flowers have withered furnishes ovules that are in good condition for examination. If the ovules are transferred to a slide, cleared with potassium hydroxide, rubbed under a cover-glass and then gently heated until ebullition begins, the presence or absence of polyembryony may be readily determined by means of the compound microscope. As a rule the seeds of the species are balloon-shaped while the seeds of the variety are slenderly elliptical. A few comparative studies will soon make clear when polyembryony is present. The difference, of course, between the species and the variety is best observed in the contents of mature capsules. As the plate (127) tends to show, there are slight differences between the lips of the species and the variety. The lip of the species is rather oblong, sometimes slightly constricted near the middle; the nectar-glands are usually shorter than in the variety. In the variety the lip is ovate or ovate-oblong in outline with the glands slightly longer and perhaps more curved than in the species. These characters, however, are not always so clearly shown as in the plate and one form of lip may pass by imperceptible degrees into the other. The only reliable distinction is found in the seeds and it would be well worth while to ascertain by cultural experiments whether or not this is due to the nature of the soil in which the plants grow and whether or not it prevails throughout the range of the species. Will the variety, for example, exhibit polyembryony if grown in bogs? Will the species produce normal seeds if transferred to upland woods?

Polyembryony was first demonstrated in *Spiranthes cernua* by Leavitt[1] in 1900, as a result of observations made in my laboratory on specimens collected at North Easton, Mass. At first the occurrence of polyembryony was thought to be local as Curtis[2] had figured

[1] Rhodora, ii (1900) 227.
[2] Bull. Torr. Bot. Club, xx (1893) 188.

normal seeds. Material from other stations (Webster, Mass., and Toronto, Canada) was found to be polyembryonic and subsequent studies seemed to confirm the belief that polyembryony is a reliable guide to the recognition of the wet meadow and bog form of *S. cernua*. Leavitt stated this positively in his paper on the Geographic Distribution of Closely Related Species.[1] In the late summer of 1920 I made careful studies of material collected in Easton and Sharon and confirmed the accuracy of Leavitt's observations. Specimens which grow associated with Calopogon and Arethusa are polyembryonic without exception according to my observations. The same is true of specimens that grow in what is usually termed sour soil. In dry fields where ericaceous plants are encroaching the polyembryonic form also prevails. In woodlands and rich upland pastures polyembryonic forms are wanting, their place being taken by the form with normal seeds that we now refer to *Spiranthes cernua* var. *ochroleuca*.

Spiranthes vernalis Engel. & Gray, as far as the northern forms referred to it are concerned, may be simply a hybrid between *S. cernua* and *S. gracilis*. In September, 1920, I found specimens of a Spiranthes which showed unmistakable signs of hybridity. They were almost perfectly intermediate between *S. cernua* and *S. gracilis* with both of which species they were associated in a small run-out field on the shore of Wilbor Pond near the Easton-Sharon line. These hybrids resembled closely some of the more robust forms of so-called *S. vernalis* collected in the neighborhood of South Easton in 1903 and 1904. Only three plants were found. Intensive exploration of the surrounding fields failed to reveal additional specimens. In its proportions the suspected hybrid resembled *S. cernua* very closely but was much taller and more slender. The flowers had the yellowish tinge that is sometimes so characteristic of var. *ochroleuca*. The lateral sepals were wide-spreading as in *S. gracilis* and the flowers were arranged in slender, elongated racemes that seemed to consist of several spirals. The characters of the hybrid are very clearly shown in the accompanying plate (128). Whether or not the southwestern forms of *S. vernalis* originally described by Engelmann and Gray were of hybrid origin and comparable to this northern form is a question for which the answer may be forthcoming as a result of experimental evidence. All of the species that enter into the ques-

[1] American Naturalist, xli (1907) 234.

tion are natives of Texas, where *S. vernalis* was originally collected, and if they inter-cross readily there is no reason to doubt the probability of the type of *S. vernalis* having been of hybrid origin. In the north, at least, it seems to be true that *S. vernalis* is usually found associated with *S. cernua* and *S. gracilis* and is unknown where these species fail. So far as Texas is concerned, however, there is one serious objection to the theory that the original *S. vernalis* was a hybrid and that is the season of anthesis of the supposed parents. In Texas *S. vernalis*, as the name implies, is a vernal species that blooms in April–June. *S. cernua*, from my records, blooms in October in Texas. *S. gracilis* blooms there in spring and autumn. Throughout its range *S. cernua* is an autumn or early winter bloomer. Experimental evidence is much needed in connection with this problem and it would be well worth while to make crosses, between the species that are suspected, during the next flowering season.

Spiranthes cernua × *gracilis*. Plant 40–43 cm. tall. Stems wand-like, about 3 mm. in diameter; pale green. Roots stout, up to 6 mm. in diameter, 1 dm. or more long. Leaves 4–6, the lowermost ones withered at flowering time, 3-nerved, obliquely erect, alternate, distichous, linear-lanceolate, 2 dm. long, 8 mm. wide, acute, margin involute. Above the leaves are four or five closely appressed bracts of which the lower ones are tubular and sheathing at base. Racemes densely flowered, 8–13.5 cm. long, 1.7 cm. in diameter. Floral bracts about 6 mm. long, strongly concave, lanceolate, acuminate, exceeding the ovary, margin inconspicuously scarious, tip appressed to the flower. Flowers 7 mm. long, white with yellow lip, at right angles to the rachis. Bracts and rachis pubescent, yellowish green in hue. Stem sparingly pubescent below, densely and shortly so above. Lateral sepals 7 mm. long with the margin strongly inrolled forming a tube at the middle, wide-spreading as in *S. gracilis*, not, as in *S. cernua*, appressed to the lip with the points above its tip and touching the petals, base strongly concave; upper sepal 8 mm. long, closely appressed to the petals. Petals lightly adherent to the upper sepal and equal to it in length, smooth, oblong, obtuse. Labellum about 8 mm. long, sharply decurved above the middle, deeply grooved along the median line beneath and in part covered with microscopically minute spherical emergences, oblong, obtuse, the apical margin lacerate-dentate, disc papillose near the apex. Calli prominent, smooth and glistening above, glandulose on the basal half; claw

broadly cuneate. Gynostemium green, glandular-pubescent on the inner face below the large, broadly ovate, somewhat protuberant stigma, 4 mm. long, the teeth of the rostellum linear-triangular, about 1.5 mm. long. Pollinia as in *S. cernua,* Tetrads characteristically irregular, extine pitted reticulate.

Massachusetts, Bristol County, at border of blueberry swamp on the side of a sloping grassy knoll in run-out pasture. Three specimens found near Wilbor Pond, North Easton, September 11, 1920, *Ames* (Herb. no. 17,391).

When collected the flowers on the lower half of the raceme were withered, although *Spiranthes cernua* close at hand had not yet opened any flowers.

The elongated, slender raceme, the wide-spreading lateral sepals, and the form of the labellum seem to indicate that the specimens here described are clearly referable to *S. cernua* × *gracilis.* The base of the lip in the hybrid is more like *S. gracilis* than *S. cernua.* Another bit of weighty evidence is found in the rarity of the plant and its distribution. No other specimens were found although a diligent search was carried on in surrounding fields during the remaining flowering period of our native species of Spiranthes.

In my remarks above on *S. vernalis* I have suggested that our New England plant referred to it may simply be a hybrid between *S. cernua* and *S. gracilis.* If this assumption is correct, then it would seem that the hybrid described under the name *Spiranthes* × *intermedia* and recorded as a cross between *S. vernalis* and *S. gracilis* may be one of the variants of a cross between *S. cernua* and *S. gracilis* in which the characters of *S. gracilis* are clearly predominant.

The abundance of fertile seeds produced by our species of Spiranthes indicates a high degree of successful pollination. I have suspected that thrips play an important part in pollinating *S. cernua* as my observations have been poorly rewarded when I have attempted to detect other insects actually engaged in visits to the flowers. *Bombus pennsylvanicus* De Geer, with pollinia of *Spiranthes cernua* var. *ochroleuca* attached to it, has come into my possession and undoubtedly other species of the genus Bombus visit Spiranthes flowers for concealed nectar. Darwin observed humble-bees as visitors to *Spiranthes autumnalis* Rich., and as species of Bombus are reported as the pollinating agents of species of the nearly related genus Goodyera it is safe to classify this group as characterized by humble-bee

flowers It is also probable that pollination is effected by nocturnal insects.

In connection with the subject of pollination in Spiranthes it is worthy of note that *Spiranthes cernua* forms embryos without pollination.[1]

In Beihefte zum Botanischen Centralblatt XXXVII (1920) Abt. II, 317–454 Rudolf Schlechter published his revision of the Spiranthеæ in which he made changes among our American species of Spiranthes. I shall take up these changes in the alphabetical sequence of the species and make such observations as seem necessary at this time.

1. *Spiranthes Amesiana* Schltr. This species is based on material collected for my herbarium by A. A. Eaton in Florida (no. 921). I distributed this material under the name of *S. tortilis* Rich. Schlechter relies on two characters for the recognition of his species, namely, the conspicuous claw of the lip and glandular hairs on the lip base. He expresses his opinion as follows: "Diese Species ist von Ames als *S. tortilis* Rich. identifiziert und verteilt worden. Tatsächlich ähnelt sie dieser sehr stark, ist aber von ihr sowohl wie von allen übrigen Arten der Verwandtschaft spezifisch recht gut unterschieden durch den auffallenden Lippennagel und die Behaarung am Grunde der Lippenplatte." These characters have broken down absolutely in my attempts to apply them in studies of Eaton's no. 921 and authentic material of *S. tortilis* from Cuba, Jamaica and Porto Rico. As Schlechter referred specimens collected for me by A. E. Wight in the Bahamas to his *S. Amesiana* I studied Wight's collection, but with the same results that I obtained in my studies of duplicates of the type number (Eaton's no. 921). The glandular hairs at the base of the lip on which Schlechter relies in part for specific distinction are found in all of the West Indian specimens referable to *S. tortilis* Rich. that I have examined. Or, to be more explicit, the hairs on the calli, margin and surface of the base of the lip are the same in character and distribution in Eaton's Floridian specimens numbered 921, in Wight's Bahaman specimens referred to by Schlechter and in authentic *S. tortilis* from the West Indies. The claw of the lip is equally conspicuous in all specimens examined and does not, as I observed it, serve as a differentiating character. Differences in size of the flower, variation in the denticulation of

[1] Leavitt in Rhodora, iii (1901) 61.

the front part of the lip and such minor characters are inconsequential as distinguishing marks of a species in Spiranthes. Varying lengths of the inflorescence, and different degrees of slenderness or stoutness of the stems are of no diagnostic value in the separation of Floridian and Bahaman plants from specimens of West Indian origin; all extremes being present in any extensive series of specimens from the same locality and readily accounted for by the remarks made above on variation due to age of plants. In my opinion *Spiranthes Amesiana* is conspecific with *S. tortilis*.

2. *Spiranthes ovalis* Lindl. In Rhodora VIII (1906) 6–7, I published the results of my studies of this interesting species which John Lindley described from material gathered in Texas by Drummond. It would seem that Schlechter overlooked this publication in the preparation of his monograph of the Spirantheæ as he refers *S. ovalis* to the realm of doubtful species. When I prepared my Synopsis of the Genus Spiranthes North of Mexico for the first fascicle of Orchidaceæ I was not acquainted with Lindley's type of *Spiranthes ovalis* and I treated it as a doubtful species. Subsequently I examined the type, which is preserved in the Hookerian Herbarium at Kew, and concluded that it is the same as *S. cernua* var. *parviflora* Chapm., *Gyrostachys parviflora* Small and *S. parviflora* Ames (non Lindl.). Schlechter proposes the new name *S. Smallii* for *S. parviflora* Ames.

3. *Spiranthes plantaginea* (Raf.) Torr. Fl. New York II (1843) 284, not Lindl.

Neottia plantaginea Raf. in Amer. Month. Mag. II (1818) 206.
Neottia lucida H. H. Eaton, Transyl. Journ. Med. 5 (1832) 107.
Spiranthes cernua var. *latifolia* Torr. Comp. (1826) 320.
Spiranthes latifolia Torr. ex. Lindl. Orch. Pl. (1840) 467.
Spiranthes aestivalis Oakes in Thomp. Hist. Vermont (1842) 200, not Rich.
Gyrostachys latifolia Kuntze, Rev. Gen. Pl. pt. 2 (1891) 664.
Gyrostachys plantaginea Britton and Brown, Ill. Fl. I (1896) 470, fig. 1122, not Kuntze.
Spiranthes lucida Ames, Orchidaceæ II (1908) 258.
Ibidium plantagineum House in Bull. Torr. Bot. Cl. XXXII (1905) 381.

As Schlechter transfers Lindley's *Spiranthes plantaginea* to Cyclopogon, Torrey's *S. plantaginea* must be reinstated, and supplants *Spiranthes lucida* in Gray's New Manual.

As Schlechter's treatment of the Spirantheæ necessitates changes in the nomenclature of several American species that are natives of the United States it may be of interest to tabulate them here.

1. Mesadenus lucayanus (*Britton*) *Schltr.*
   Ibidium lucayanum Britton.
   Spiranthes lucayana Cogn. Florida.
2. Cyclopogon cranichoides (*Grieseb.*) *Cogn.*
   Pelexia cranichoides Grieseb.
   Spiranthes Storeri Chapm.
   Beadlea Storeri Small.
   Sauroglossum cranichoides Ames. Florida.
3. Centrogenium setaceum (*Lindl.*) *Schltr.*
   Collea calcarata Lindl.
   Neottia calcarata Hook. f.
   Pelexia setacea Lindl.
   (?) *Eltroplectris acuminata* Rafinesque. Florida.

The genus Stenorrhynchus is retained in the original conception of that genus. Representatives are found in the southern United States.

PLATE 127.

Spiranthes cernua L. C. Rich.

Figs. 1 & 2. General habit, natural size.
Fig. 3. Lateral sepal ×4.
Fig. 4. Petal ×4.
Fig. 5. Upper sepal ×4.
Fig. 6. Labellum ×3. Spread out to exhibit outline.
Fig. 7. Column ×8. The heart-shaped area represents the stigmatic surface; the disc of the Pollinia is indicated by the shaded area above.
Fig. 8. Pollinia ×10.
Fig. 9. Pollen tetrad highly magnified.
Fig. 10. Seed much enlarged, showing polyembryony.
Fig. 11. Section through perianth, column and ovary ×4, to show position of anther, Pollinia and honey gland.

Spiranthes cernua var. ochroleuca Ames

Fig. 12. General habit, leaves and roots removed, natural size.
Fig. 13. Labellum ×3. Spread out to exhibit outline.

PLATE 128.

Spiranthes cernua × gracilis.

Fig. 1. General habit, natural size.
Figs. 2 & 3. Flower ×4. Showing wide-spreading lateral sepals.
Fig. 4. Labellum ×4.
Fig. 5. Column ×4.
Fig. 6. Pollen tetrad highly magnified.
Fig. 7. Lateral sepal ×4.
Fig. 8. Petal ×4.

PLATE 129.

SPIRANTHES GRACILIS (BIGEL.) BECK

Figs. 1 & 2. General habit, natural size.
Fig. 3. Flower ×6. One lateral sepal removed.
Fig. 4. Labellum ×6. Spread out to exhibit outline.
Fig. 5. Column ×11.
Fig. 6. Petal ×11.
Fig. 7. Upper sepal ×11.
Fig. 8. Labellum and column in natural position ×11.
Fig. 9. Section through perianth, column and ovary ×8.
Fig. 10. Lateral sepal ×8.
Fig. 11. Pollen tetrad highly magnified.
Fig. 12. Pollinia, from below (at left), from above (at right).
Fig. 13. Seed, highly magnified.

BUSSEY INSTITUTION OF APPLIED BIOLOGY,
HARVARD UNIVERSITY.

SCUTELLARIA EPILOBIIFOLIA.

M. L. FERNALD.

THE common skullcap of gravelly shores from Newfoundland to British Columbia, south into the northern states, which has always passed as *Scutellaria galericulata* L., has the showy corolla 1.5–2.5 cm. long, with whitish or pale tube and throat, the galea and lips deep violet-blue. As contrasted with our plant true *S. galericulata* of Europe has the corolla at most about 1.5 cm. long and of a nearly uniform paler bluish color (at least as indicated by colored plates and descriptions). The European plant, too, is less pubescent or even glabrous and its leaves not so regularly cordate at base as in the American. In 1832 Arthur Hamilton distinguished the American plant as *S. epilobiifolia*,[1] but his species has been very generally reduced to the Old World *S. galericulata*. When, however, the fully mature nutlets of the two plants are examined they show such striking differences that it becomes apparent that Hamilton's species should be recognized. In *S. galericulata*, the European plant, the nutlets are 1.2–1.3 mm. broad and finely and rather sharply muriculate; in the American plant, *S. epilobiifolia*, they are 1.5–2 mm. broad and coarsely pebbled or almost warty. This difference in the nutlets seems to be constant in all the mature specimens examined and no *S. galericulata* has been detected in the large mass of American specimens. Our plant is, then,

[1] A. Hamilton, Esquisse d'une Monographie du Genre Scutellaria, 32 (1832).

Scutellaria epilobiifolia Hamilton, Mon. Gen. Scut. 32 (1832). *S. galericulata* of Am. authors, not L.

Two striking color-variations occur:

Forma **rosea** (Rand & Redfield), n. comb. *S. galericulata*, forma *rosea* Rand & Redfield, Fl. Mt. Desert, 137 (1894).

Forma **albiflora** (Millsp.) n. comb. *S. galericulata*, forma *albiflora* Millsp. Fl. W. Va. 428 (1892).

Parallel color-forms of *S. lateriflora* are:

S. lateriflora L., forma **rhodantha**, n. f., corolla rosea. Type: alluvial thickets and woods near mouth of Dartmouth River, Gaspé Co., Quebec, August 26 and 27, 1904, *Collins, Fernald & Pease* in Gray Herb.

S. lateriflora, forma **albiflora** (Farwell), n. comb. *S. lateriflora*, var. *albiflora* Farwell, Mich. Acad. Sci. Ann. Rep. xix. 249 (1917).

Gray Herbarium.

CORRECTIONS IN NOMENCLATURE.

Oliver Atkins Farwell.

Carex gigantea, Rudge, Trans. Linn. Soc. VII. 99. pl. 10, f. 2, 1804. Rudge's name has been adopted by Robinson & Fernald in Gray's New Manual and by Mackenzie in Britton & Brown's 2nd Ed. of the Illustrated Flora for the plant named by L. H. Bailey, *C. grandis*, i. e., the *C. gigantea* of Dewey. An examination of Rudge's plate shows an achene with the width and length about equal and with knobbed angles, the knobs of the lateral angles being faintly shown but that of the intermediate angle is quite prominent. It is a very good illustration of the achene of *C. lupuliformis* Sartwell. The achene of *C. grandis* Bailey, as illustrated by Robinson & Fernald, l. c. p. 250, f. 541, and by Britton & Brown, l. c. 441, f. 1109, is decidedly different; the width is much greater than the length, the angles are broadly rounded but not knobbed, and the general outline is transversely oblong while that of *C. gigantea* Rudge is rhomboidal or kite-shaped. It seems, therefore, that Bailey was quite right in considering *C. gigantea* Dew. to be a species distinct from *C. gigantea* Rudge. These two forms and *C. lupulina* are best considered as varying forms of one widely distributed polymorphous species to which "*gigantea*" is the earliest name applied, and most appropriately so.

C. GIGANTEA Rudge l. c. (*C. lupuliformis* Sartwell in Dew. Amer. Journ. Sci. (II), 9, 29, 1850; *C. lupulina* var. *polystachya*. Schw. & Torr. Ann. Lyc. 1, 337, 1825).

Forma a. **minor** n. f. pistillate spikes narrow and slender, the perigynia being smaller, 10–11 mm. in length and proportionately narrower. Throughout the range of the species. Harris, Oakland Co., Michigan, Billington & Farwell, No. 5064, July 13, 1918.

The typical form of the species with much larger spikes and longer perigynia (13–20 mm. long) was not found in the vicinity. This form as found at Harris is smaller than the species in all its parts, but I am informed by Mr. Harold St. John, late of Harvard University, that only the perigynia and spikes are constant in their smaller size.

Var. 1. LUPULINA (Muhl) Farwell, Rept. Comm. Parks, Detroit, 11, 39, 1900.

Forma a, **pedunculata** (Dew.) n. f. (*C. lupulina*, Muhl. var. *pedunculata*, Dew. in Wood, Bot. and Flor. 376, 1870).

Forma b, **Bella-villa** (Dew.) n. f. (*C. Bella-villa*, Dew. Amer. Journ. Sci. (II) 41, 229, 1866.

Var. 2, **grandis** (Bailey) n. var. (*C. grandis*, Bailey, Mem. Torr. Bot. Club, 1, 13, 1889).

C. RETRORSA, Schw. var. **Bradleyi** (Dew.) n. comb. (*C. Hartii*, var. *Bradleyi*, Dew. Amer. Journ. Sci. (II) 41, 226, 1866; *C. retrorsa*, var. *Hartii* (Dew.) A. Gr. Man. 600, 1867).

C. RETRORSA, Schw. var. **gigantoides** (Dew.) n. comb. (*C. lupulina*, var. *gigantoides*, Dew. l. c. 328; *C. retrorsa*, var. *Macounii* (Dew.) Fernald, RHODORA 3, 55, 1901).

The above changes are necessary under the International Rules of Nomenclature.

DEPARTMENT OF BOTANY, PARKE, DAVIS & Co., Detroit, Mich.

TWO RECENT PUBLICATIONS ABOUT MUSHROOMS.—We are somewhat late in registering an appreciation of Mr. L. C. C. Krieger's colored plates of mushrooms which were made available to a large public in the May, 1920, number of the National Geographic Magazine. The artist, who is also an accurate and earnest student of this group of fungi, was so long a resident of Massachusetts, where for many years he was employed in making drawings for Dr. Farlow, in Cambridge, that his work may almost be counted as that of a New Englander. Indeed, some of the drawings now published are recognizable as dating from the time when he was one of us. Those who were privileged to see the work that he was then doing, so faith-

ful in line and tint and texture, have long regretted that these unsurpassed plates must remain for a time a private possession. The plates now published are not, of course, of the Farlow series. They show a few striking common species. But they serve to display Mr. Krieger's unusual gift, the rare combination of artistic sense with scientific truth, which fits him to do well just this work. Many have been the illustrators of the fleshy fungi. But a survey of their drawings, from the time of the herbalists down to the present, will show that most of the work only approximates, and much of it perverts the facts. Mr. Krieger is one of the very few whose accuracy and cunning almost place the object right before us. His friends will congratulate him on at last being able to make his work known.

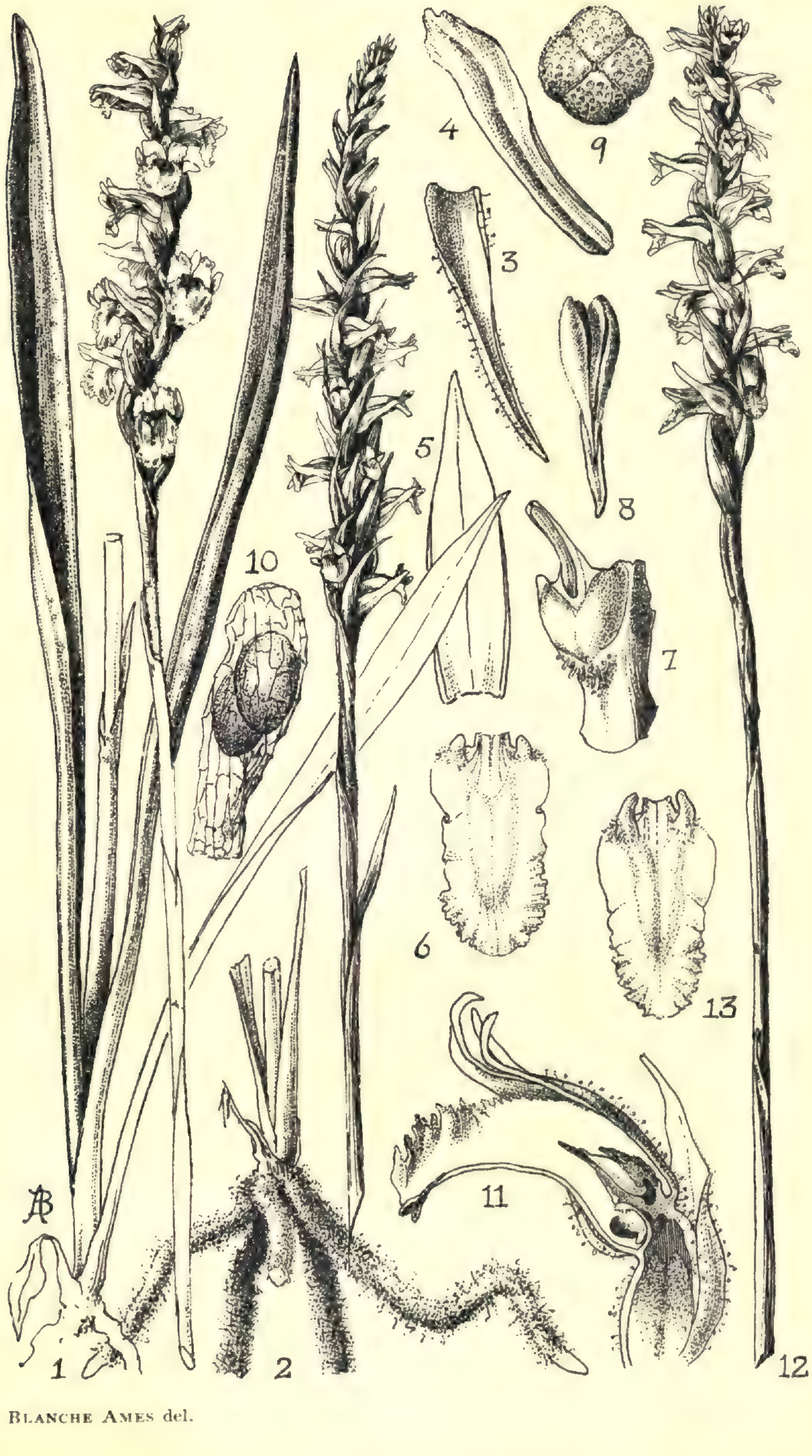
The accompanying text, if somewhat discursive and eclectic, is pleasantly readable and full of information. It is further illustrated by numerous excellent and well chosen photographs among which those made by A. G. and B. Leeper, and by George Shiras deserve mention.

Mr. Krieger has also published[1] in a folder of pocket size a chart of the genera of Agarics, illustrated by outline drawings. This is intended for the beginners, to remove the confusion caused by the bewildering similarity of plants that turn out to be so infinitely various. Brief critical remarks anticipate difficulties of interpretation and provide means of recovery from following misleading clues. The chart is arranged to serve as a key, and also to show at one glance the interrelations of the details of the system of classification, as based on the color of spores, and on the structure of the sporophore. The use of this graphic key should soon fix in the learner's mind what facts are most important and first to be observed, and thus establish a definite conception of the type of structure that corresponds to each generic name.

Not only those who are just entering upon the study of these fascinating plants, but many to whom they are already familiar will thank Mr. Krieger for these two publications.—H. W.

The dates of the February and March issues (both unpublished as this goes to press) will be announced later.

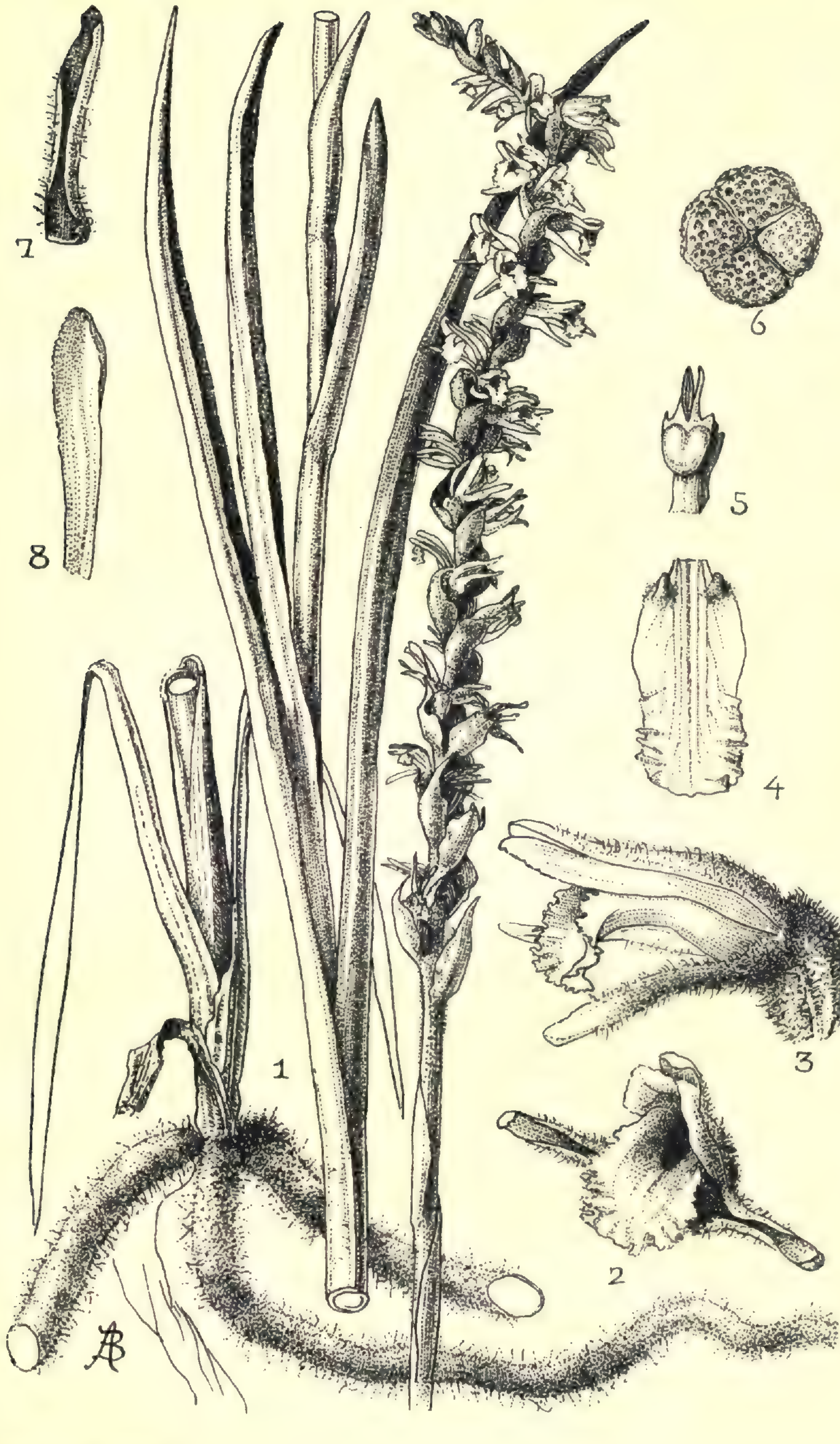
[1] Field Key to the Genera of the Gilled Mushrooms, by Louis C. C. Krieger. The Norman, Remington Co., Baltimore, 1920. $1.00.



Blanche Ames del.

Spiranthes cernua Rich. Figs. 1-11

S. cernua var. ochroleuca Ames. Figs. 12-13



Blanche Ames del.

Spiranthes cernua x gracilis

Blanche Ames del.

Spiranthes gracilis (Bigel.) Beck

Rhodora

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CONTRIBUTIONS FROM THE GRAY HERBARIUM OF HARVARD UNIVERSITY.—NEW SERIES, No. LXIII.

THE GRAY HERBARIUM EXPEDITION TO NOVA SCOTIA, 1920

M. L. Fernald

(Plate 130)

Part I. Journal of the Expedition.[1]

At first thought Nova Scotia would hardly occur to the student of our vascular floras as a particularly inviting field for a summer's expedition. The province is one of the longest-settled and most visited regions of North America; the area best known to tourists, "the Valley" (the valleys of the Cornwallis and Annapolis Rivers), being closely cultivated and widely exploited as the "Evangeline Land," the home of Nova Scotian farms and orchards. The wildest region of the province, the northern half of Cape Breton Island, geologically, physiographically and floristically very different from Nova Scotia proper, has already attracted several discriminating collectors and has been carefully treated, from the ecological viewpoint at least, by Nichols,[2] whose work on the region has been called "by far the most important ecological study yet made on the vegetation of northeastern America."[3] The veteran Government Naturalist, the late Professor John Macoun, repeatedly collected in all parts of the province; and the local botanists who, in Nova Scotia

[1] Read before the New England Botanical Club, February 4, 1921.

[2] Nichols, The Vegetation of Northern Cape Breton Island, Nova Scotia. Trans. Conn. Acad. Arts and Sci. xxii. pp. 249–467 (1918).

[3] Ganong, Rhodora, xxi. 171 (1919).

as almost everywhere else, were more active in the field a generation or two ago than at the present period of narrow specialization or indifference to the tremendous problems of natural history, have published numerous local lists and records, including the *Catalogue of the Flora of Nova Scotia* by Lindsay.[1] Professor Sommers's *Introduction* to the latter work gives a pretty strong intimation that there is little left to be learned regarding the vascular element of the Nova Scotian flora, an impression surely conveyed by the following words: "it may be accepted as the most complete synopsis of the Nova Scotian Flora yet offered . . . . . while the P[h]enerogamia exclusive of Cyperaceae and Gramin[e]ae are nearly complete, the Cryptogamia, excepting Filices and Lycopodiac[ea]e, are but sparingly represented." Furthermore, one of the most acute Nova Scotian botanists of recent years, the late Dr. Charles Budd Robinson, has stated that, "In general, the flora of the peninsula and island is composed of plants which have migrated from the west or southwest through New Brunswick;"[2] the other elements of the Nova Scotian flora recognized by Robinson being the introduced weeds and, in northern Cape Breton, "a third element, namely, species that are believed not to occur anywhere upon the peninsular portion of the province," in illustration of which 8 species are mentioned, some of which, like *Habenaria blephariglottis*, *Aster nemoralis* and *Drosera intermedia*, are not only found on the peninsula but are there dominant plants over hundreds of square miles of acid bog. In fact, Professor L. W. Bailey, in his report on the geology of Yarmouth and Digby Counties had specially commented on "the abundance of orchids, . . . The most common species . . . . . is the white-fringed orchis (*Habenaria blephariglotis*, Hook)."[3] It would thus seem, that the students of our northeastern flora, desirous of spending the summer in the field to the best advantage and restrained by the present state of transportation-facilities and of manpower from the exploration of less accessible regions of Gaspé, Newfoundland or Labrador, would be almost wasting time by concentrating on Nova Scotia.

Nevertheless, outside the very general collections of Professor Macoun there exist, in this country at least, comparatively few

[1] A. W. H. Lindsay, Proc. and Trans. N. S Inst. Nat. Sci. iv. pt. 2, 184–222 (1877).
[2] C. B. Robinson as reported in Torreya, vi. 257 (1906).
[3] L. W. Bailey, Geol. Surv. Can. Ann. Rep. n. s. ix. 18M (1898).

specimens to represent Nova Scotia; and when a prominent present-day Nova Scotian botanist, asked about some critical species he is supposed to have discovered, replies that his only available evidence is a marginal memorandum in the *Manual*, it seems time that we learn what actually grows in the Province. Furthermore, in spite of the rather extreme generalization of Professor Sommers, that "The subarctic character of our [Nova Scotian] flora will be observed from a study of our list" and the fact that the list has less than forty subarctic species and that this and other lists indicate a prevailingly Canadian and Alleghenian flora with forests of spruce, larch, fir, white pine, red pine, canoe birch, white ash, sugar maple, American elm, beech, red oak and hop hornbeam, we had a few indications of the presence in Nova Scotia of southern coastal plain plants,—just enough to stimulate the imagination.

The best known example of the very few characteristic coastal plain plants which we knew to be in Nova Scotia is *Schizaea pusilla*, the famous Curly Grass of the New Jersey pine barrens and of the Newfoundland barrens, an isolated representative in eastern North America of a large genus of the tropics and the southern hemisphere. Between the pine barrens of New Jersey and Nova Scotia *Schizaea* is quite unknown, although repeatedly sought on Long Island, Nantucket and Cape Cod, and in peninsular Nova Scotia its occurrence has rested solely upon a single colony discovered in July, 1879, by Mrs. Britton,[1] whose station was very limited for, as she has reported, she "collected . . . nearly all there were" and "Prof. Mackay, of Nova Scotia, has since searched in the locality where I found it, but in vain."[2] Subsequently *Schizaea* has been found on the barrens of Cape Breton by Nichols, but not on the mainland of Nova Scotia.

Another coastal plain plant, the Inkberry, *Ilex glabra*, was in Lindsay's *Catalogue*, on the authority of Sommers, as found at Halifax; but, with no specimens known from east of Massachusetts, the record seemed too doubtful and the species was excluded by Macoun in 1883 from Part 1 of his *Catalogue of Canadian Plants*. In 1886, however, Macoun reinstated it, for in the meantime he had himself collected it near Halifax and received material from Shelburne.

[1] E. G. Knight, as reported in Bull. Torr. Bot. Club, vii. 1 (1880); Gray, Bot. Gaz. v. 4 (1880).

[2] E. G. Britton, Linn. Fern Bull. iv. 18 (1896).

Other coastal plain plants in Lindsay's list are *Woodwardia virginica*, *Corema Conradii* and our two species of *Hudsonia*, Nova Scotian specimens of which have been well known, and the following for which vouchers have been lacking: *Cupressus* (now *Chamaecyparis*) *thyoides*, *Eriocaulon decangulare*, *Xyris bulbosa* (now *X. torta*), *Juncus marginatus*, *Ilex opaca*, *Solidago odora* and *Coreopsis* (now *Bidens*) *discoidea*.

The latter list has always been treated as based on errors of determination, although the verification of the occurrence in Nova Scotia of *Ilex glabra*, the fully authenticated occurrence there of *Schizaea pusilla* and the recent discovery[1] there of a single plant of the Golden Crest, *Lophiola*, a genus supposed to reach an isolated northern outpost in the pine barrens of New Jersey, have tended to render Lindsay's list less incredible. Furthermore, we must not forget that specimen of *Ceratiola ericoides* Michx.[2] recorded as long ago as 1842 by Edward Tuckerman. *Ceratiola* is a monotypic genus of shrubs of the *Empetraceae*, supposed to be restricted to pine barrens from South Carolina to Florida and Alabama. But Tuckerman, in recording the occurrence in Lambert's herbarium of *Corema Conradii* (as *Oakesia*), said to have come from "Newfoundland, Cormack," appended this important note:

"The small label at the top of the sheet which contains this specimen (apparently not original) reads as follows:—'*Cistus? from Nova Scotia.*' Above has been written by the late Prof. Don '*Ceratiola cericoides* [*ericoides*],' in the same envelope with a fine and *female* specimen of which plant it is, singularly, placed."[3]

Whether the *Ceratiola* actually came from Nova Scotia had, of course, long been in doubt, but in view of other pine barren species demonstrated to occur there, the shrub was worth keeping in mind.

Altogether, the list of southern coastal plain plants reported from Nova Scotia numbered between 30 and 40, some of them without vouchers; others, like *Schizaea pusilla*, *Lophiola* and *Ilex glabra*, supported by actual modern specimens. They had all been discovered or reported at scattered intervals and mostly by different observers and it seemed apparent that they must be extremely local plants. In view of the occurrence, especially in eastern Newfound-

[1] See Nichols, Rhodora, xxi. 68 (1919).
[2] In this report the authors are included only for species not in Gray's Man., ed. 7.
[3] Tuckerm. in Hook. Lond. Journ. Bot. i. 445 (1842).

land, of a large coastal plain element,[1] and the fact that several such species, unknown in adjacent New Brunswick and eastern Maine are obviously isolated on Nova Scotia as remnants of the flora which in the late Pleistocene or even later had lived on the then elevated but now submerged continental shelf, it became very evident that not only was there plenty of good botanizing left in peninsular Nova Scotia but that the region must hold some secrets of profound importance to a clear understanding of the history of life in eastern America.

And since the least botanized and least cultivated region of the peninsula happens to be the area of highly silicious and mostly acid quartzites and slates extending from Digby County around the coast via Yarmouth and Shelburne to Halifax, thence on to Canso, constituting the "gold-bearing series" of the province, and the great granite masses which are interspersed through the quartzite area, it seemed probable that good results would be obtained by devoting a season to these formations. The silicious rocks of the gold-bearing series are essentially identical with the Avalonian formation of southeastern Newfoundland, where have been found many species isolated, some from the South, some from Atlantic Europe. In the silicious regions of Cape Cod and of Newfoundland the most fruitful habitats have always proved to be the boggy barrens and the pond-shores and, upon studying the detailed topographic maps of Nova Scotia, it was consequently a most promising sign, to find that in the belt of Avalonian and granitic rock there are no fewer than 2,600 lakes and fresh-water ponds, as well as an endless profusion of bogs, savannahs and barrens, vastly more than in the other half of the province, where a count shows fewer than 800 lakes.

There was, therefore, no further doubt about the region to be explored and a summer's campaign was made possible through the liberal support of such generous friends as Colonel John E. Thayer and Mr. Walter Deane and the cooperation of Dr. William McInnes, Directing Geologist of the Geological Survey of Canada, and of Mr. R. R. Farrow, Canadian Commissioner of Customs. Through the helpful interest of Professor Kenneth G. T. Webster of Harvard University and his brother, Dr. Charles Webster of Yarmouth, a suitable home with a dry barn was secured in the latter town and,

[1] See Fernald, Rhodora, xiii. 135–162 (1911); Am. Journ. Sci. ser. 4, xl. 17 (1915); Am. Journ. Bot. v. 238 (1918).

as it seemed quite appropriate that the flora of New Scotland should interest botanists of New England, invitations were sent to a number of members of the New England Botanical Club to join for such time as they could during the summer in making as complete a survey as possible of the vascular flora of western Nova Scotia. Altogether there were eight in the party,[1] though not all at one time. 5000 sheets of drying paper, nearly as many corrugated "ventilators," a large stock of white pressing paper, seven large collecting boxes, ten presses, a bushel of flake naphthaline (to keep out mold and hasten drying of "soggy" specimens) and the other necessary equipment (to the extent of 16 heavy freight boxes) were shipped from the Gray Herbarium to Yarmouth, where they are entered as consigned by "Messrs. Grey, Hubanning & Co., Boston;" and on July 1st four members of the party left Boston. I was slightly delayed in starting and saw Bissell, Long and Linder leave on the early-morning train without me, to be joined en route by Pease. Their first landing in Nova Scotia was at Digby, where, waiting for the train to Yarmouth, they made the acquaintance of the village weeds and collected for the first time the beautiful Ladies' Mantle, *Alchemilla vulgaris*,[2] afterward found to be one of the most obnoxious though handsome weeds of western Nova Scotia; *Sedum stolomiferum*, then only in bud, but later, when its pink petals were expanded, seen along several roadsides around the coast as far as Barrington; and *Silene gallica*, a somewhat unusual ballast weed. On the marshes *Puccinellia maritima*,[3] was in fine condition, a characteristic plant of Massachusetts marshes, afterward found to be very generally distributed on the coast of Nova Scotia.

When I arrived on July 6 at Mrs. Frank Davis's, where we had most comfortable and home-like quarters, presses of specimens were out-doors by the barn enjoying one of the last sunnings for several weeks. In the absence of maps, which were in my trunk, the advance

[1] The members of the party and the periods of their stay in Nova Scotia follow:
Ralph C. Bean, July 16–July 30.
Charles H. Bissell, July 2–July 23; August 11–September 2.
Merritt L. Fernald, July 6–September 9; October 6–8.
Dr. and Mrs. Charles B. Graves, August 10–August 24.
David H. Linder, July 2–September 9; October 6–8.
Bayard Long, July 2–September 9.
Arthur Stanley Pease, July 2–July 21.
Donald White, July 16–August 6.

[2] See Fernald & Wiegand, Rhodora, xiv. 232 (1912).

[3] See Fernald & Weatherby, Rhodora, xviii. 6 (1916).

guard had conscientously weeded the wharves and roadsides of Yarmouth, so that we should not later have them much on our minds: *Alopecurus geniculatus* and *Myosotis scorpioides* in the ditches; *Rumex Acetosa*, with its tall red wands, picturesque in the fields; *Achillea Millefolium*, mostly with deep rose-colored rays, common by roadsides; numerous garden-escapes,—*Convallaria majalis*, *Salix purpurea* in great abundance, *Crataegus monogyna* Jacq., the ubiquitous hawthorn of hedges, *Iris Pseudacorus* well established by many pools, *Lysimachia punctata* and *Veronica longifolia* in numerous thickets, and, it would seem, almost every hardy garden perennial, here luxuriating in the foggy and misty atmosphere and spreading freely to the roadsides; and, in rubbish, such unusual plants as *Vicia angustifolia* Reichard, var. *uncinata* (Desv.) Rouy & Foucaud, which Wiegand and I had found on the Maine side of the Bay of Fundy,[1] and a dwarf variety of *Trifolium pratense*, with low stems (1–2 dm. high) and very small leaves with rounded obovate leaflets only 0.5–1.5 cm. long, a plant which J. F. Collins, Pease and I had found naturalized at various points near the tip of the Gaspé Peninsula in 1904 and which seems to be referable to the European var. *frigidum* Gaud.[2]

In more natural habitats they had been getting, on springy and peaty slopes, many good things: *Carex paniced* and *C. leporina*, both rare species in North America, and *Sieglingia decumbens* (L.) Bernh., the characteristic Heath Grass of peaty soils of western Europe, also common on boggy slopes in eastern Newfoundland,[3] but not generally recognized as occurring on the American continent. Here, as elsewhere in Yarmouth County, it was invariably in half-natural habitats where it might be indigenous, but always too near civilization and pastures for us yet to feel confident that it is native. It is a neat grass, forming dense tussucks, with slender, wiry culms, and inflorescences which superficially so suggest *Danthonia* as to explain why Linnaeus placed this plant in that genus. The open places were bright with three or four species of *Sisyrinchium*: the common northern *S. angustifolium* and, quite as common if not more general, the two southern species, *S. gramineum* and *S. atlanticum*. The

[1] See Fernald & Wiegand, Rhodora, xii. 140 (1910).

[2] *T. pratense* L., var. *frigidum* Gaud. Fl. Helvet. iv. 582 (1829). *T. nivale* Sieb. Herb. Fl. Austr. no. 236, acc. to Koch. *T. pratense*, γ *nivale* (Sieber) Koch, Syn. Fl. Germ. 168 (1835).

[3] See Fernald, Am. Journ. Bot. v. 229, fig. 13, and 243 (1918).

former of these two extends to Newfoundland,[1] but west of Nova Scotia reaches its northeastern limit in the lower Penobscot valley; while *S. atlanticum* has heretofore been unknown northeast of southern York County, Maine. On open gravelly soil Pease and Linder had also found a plant which so closely matches *S. arenicola* of the sands of New Jersey, Long Island and Nantucket that there can be little question as to its identity. The Yarmouth material, however, seems like a starved *S. gramineum* with the short and stiff basal fibres (one of the chief characters) persistent perhaps through a response to ecological conditions, while material which Pease, Long and I subsequently found on dry plains at Middleton, Annapolis County, seems like *S. angustifolium* except for the stiff and persistent tufts of basal fibres. May it not be that *S. arenicola*, instead of being a true species, is an ecological state due to the sandy substratum in which it grows?

But still more interesting was the discovery that the spruce bogs, besides having the plants one would naturally expect (the boreal *Carex paupercula*,[2] *C. pauciflora*, *Smilacina trifolia*, *Vaccinium Oxycoccus*, *Empetrum nigrum*, etc.), shelter along with the already well known coastal plain *Carex atlantica* Bailey (*C. sterilis* of the Manual)[3] and *C. exilis*, the delicate little southern *C. Howei* Mackenzie,[4] the plant treated in the 7th edition of Gray's *Manual* as *C. scirpoides*, var. *capillacea* but clearly a distinct species of the coastal plain. *C. Howei*, which extends in New England north to the lower Merrimac, is from Cape Cod southward one of the dominant plants of the so-called Louisianian and Carolinian Cypress (*Chamaecyparis*) swamps, but throughout western Nova Scotia it is quite as dominant a sedge of the "Hudsonian" spruce swamps (fig. 1). Another

[1] See Bicknell, Bull. Torr. Bot. Cl. xxvii. 238 (1900) and Fernald, Am. Journ. Bot. v. 243 (1918).

[2] There seems no good reason to recognize vars. *irrigua* (Wahlenb.) Fernald and *pallens* Fernald. Fifteen years of field-work since they were proposed shows them to be only trivial variants.

[3] *C. sterilis* Willd. has been variously misunderstood, but Mackenzie (in Britton & Brown, Ill. Fl., ed. 2, i. 377) seems to have reached a satisfactory solution of its identity: a very distinct but little-collected species of limestone regions from Newfoundland and Anticosti westward to Minnesota, and south through the limestone region of western New England to northern New Jersey, Pennsylvania, etc. This plant, until recently merged with *C. interior* Bailey (*C. scirpoides*, at least of my own treatments), differs from it in having very rough beaks which barely exceed the broad and very long brown scales. The coastal plain plant which I have called *C. sterilis* is mostly *C. atlantica* Bailey.

[4] Mackenzie, Bull. Torr. Bot. Cl. xxxvii. 245 (1910).

southern sedge which they had been finding common in swales, and which we afterward saw everywhere we went in the Avalonian formation but nowhere else, is the characteristic plant of swamps of southern New England, *Carex bullata*, var. *Greenei*, found from Georgia north to York County, Maine, but like *C. Howei* and *Sisyrinchium atlanticum* not previously known to occur in Canada.

On July 7 we started explorations a little more remote from Yarmouth; Bissell, Pease and Linder going to the local summer resort, Lake Annis, where *Ilex glabra* and *Smilax rotundifolia* had been reported, and from there walking north a few miles to Hectanooga station; Long and I going to Meteghan station to explore an extensive spruce and larch bog, the "caribou barren," which we had noted from the train. On the way north, as we closely watched the country from the car-windows, we were puzzled to understand how the *Smilax* and the *Ilex* could be found in this region of spruce, fir and larch forest and cold boggy barrens and as this impression grew upon us we did not hesitate to express great scepticism, for it seemed so obvious that, if *Smilax*, *Ilex glabra* and *Schizaea* really did occur in this Canadian and Hudsonian region, they must lurk in some very localized pockets not visible from the train.

The Lake Annis party failed to locate either of the specialties and brought back a very characteristic lot of plants of ordinary spruce woods and bogs, with the first Dwarf Mistletoe, *Arceuthobium pusillum*, of the season, although later the "arceuthobiate" spruces were regularly seen and as the season advanced we secured beautiful material of the parasite which made these first specimens seem hardly worth preserving. They also had *Senecio Robbinsii*, which we had seen abundantly from the train, this beautiful species apparently everywhere replacing *S. aureus* in the extensive silicious region. They had the southern High-bush Blueberry, *Vaccinium corymbosum*, in perplexing variety; *Pyrola rotundifolia*, var. *arenaria* Mert. & Koch, which we had known from Newfoundland[1] but not farther south, although we continued through the summer to find it, always rather scarce, on sandy barrens as far east as Middleton, Annapolis County; and wonderful material of the fructiferous *Equisetum limosum*, forma *polystachium* (Brueckn.) Doell.[2]

Starting south from Meteghan station, Long and I quickly found ourselves seduced into collecting *Rubus*, a genus which he and the

[1] See Fernald, Rhodora, xxii. 122 (1920).
[2] See Fernald & Weatherby, Rhodora, xxiiii. 77 (1921)

others had nobly attended to around Yarmouth; but after nearly filling out man's size collecting boxes with blackberry canes, we were attracted by a very handsome and distinct *Antennaria* on the dry embankment, the foliage suggesting very large *A. neodioica* but the large heads with a strong crimson tinge suggestive of *A. Parlinii*. This was something neither of us had ever seen growing, so we compressed the blackberry specimens (and made a necessary screen over them with large leaves) to make room for a fine lot of the *Antennaria*, and whenever we subsequently saw it, as we did several times and as far east as Hants County, we were regularly struck with its great beauty. The plant proves to be my own *A. neodioica*, var. *grandis*, a well marked extreme of a polymorphous species, which I had known only through herbarium material; and, although in the field it looks very distinct, I am unable to find a single character by which it can be specifically separated.

Striking out into the wet mossy bog we were interested to find *Potentilla canadensis*, var. *simplex* of dry fields in New England and the eastern States generally and the Checkerberry, *Gaultheria procumbens*, of our dry pastures and woods, growing in deep, wet sphagnum along with the other bog plants, *Andromeda glaucophylla, Kalmia polifolia, Carex paupercula, C. pauciflora, Eriophorum angustifolium* and *Vaccinium Oxycoccus;* but we were not wholly surprised, for Long had been collecting the *Potentilla* in wet bogs about Yarmouth and I had known *Gaultheria* as a wet-bog species on the Gaspé Peninsula.[1] Crossing the bog, we soon came into carpets of the arctic Crowberry, *Empetrum nigrum* (fig. 2), common enough at Yarmouth, but here in the cold bog retaining its flowers unusually late into the summer, still in such good condition that we had the satisfaction for the first time in our experience of securing good staminate material. And there close to *Empetrum*, right in the middle of an otherwise almost typical Hudsonian bog was the Inkberry! We could hardly believe our eyes but there was the glossy-leaved *Ilex glabra* (fig. 3), much smaller than on Cape Cod or in New Jersey, Florida or Alabama, but healthy and just beginning to bloom. In the spruce woods at the edge of the bog the High-bush Blueberries were as perplexing as on Cape Cod or in New Jersey, but here there were some forms which we had not previously met.

After a day of work on the presses we were ready to try the country southward, Long and Pease ("Longipes" of our field-notes) trying

[1] See Fernald, Rhodora xiii. 97 (1911).

the region of open, boggy barrens east of Argyle Head; Bissell, Linder and I examining the granitic coast of extreme southwestern Nova Scotia at Shag Harbor. We got into a typical Hudsonian bog region like bits of the outer coast of eastern Maine[1] or of Newfoundland, with their great abundance of Bakeapple (*Rubus Chamaemorus*), *Carex pauciflora*, *C. trisperma*, var. *Billingsii*, *Empetrum nigrum*, and swales of *Eriophorum callitrix* or interrupted turf of *Scirpus cespitosus*, var. *callosus* Bigelow.[2] Around the shores were the usual coastal plants of this latitude, such as *Elymus arenarius*, var. *villosus* E. Meyer,[3] *Coelopleurum lucidum* (L.) Fernald,[4] and *Euphrasia purpurea* Reeks, var. *Randii* (Robinson) Fernald & Wiegand, but here apparently all belonging to the white-flowered forma *albiflora* Fernald & Wiegand;[5] and the only traces of a coastal plain flora noticed were the ubiquitous *Sisyrinchium atlanticum*, *Carex atlantica* and *C. bullata*, var. *Greenei* and the almost ubiquitous Bog Huckleberry, *Gaylussacia dumosa*, var. *Bigeloviana* Fernald,[6] northern bog variant of a wide-ranging coastal plain species.

But when, returning to Yarmouth, Long and Pease joined us on the train, although they had some boreal species, such as *Scirpus cespitosus*, var. *callosus* and *Carex oligosperma* (boreal, but found on Cape Cod), they showed a very different lot of plants from the bog-barrens east of Argyle Station and the peaty and sandy soil about Sand Pond. They were beaming over the prompt discovery of *Schizaea pusilla* (fig. 11), a young *Bartonia*, a young *Xyris* suggesting the coastal plain *X. caroliniana* and, in flower, the northern representative of the genus, *X. montana*, a young *Solidago* of the subgenus *Euthamia*, obviously related to the coastal plain *S. tenuifolia*, *Eleocharis Robbinsii* of coastal plain sloughs south to Florida, *Panicum spretum*, a common species of the coastal plain south to Texas, *Calamagrostis Pickeringii*, var. *debilis* Fernald & Wiegand, heretofore unknown[7] between eastern Massachusetts and Newfoundland, *Lycopodium inundatum*, var. *Bigelovii* (*L. adpressum* (Chapm.)

[1] See Fernald & Wiegand, Rhodora, xii. 106 (1910); Knowlton, Rhodora, xvii. 148, 149 (1915).
[2] See Fernald, Rhodora, xxiii. 24 (1921).
[3] See St. John, Rhodora, xvii. 99 (1915).
[4] Rhodora, xxi. 146 (1919).
[5] Rhodora, xvii. 188 (1915).
[6] Rhodora, xiii. 99 (1911).
[7] Rhodora, xv. 135 (1913).

Lloyd & Underw., *L. Chapmani* Underw.),[1] a coastal plain extreme of the species extending from Louisiana via Florida to eastern Massachusetts but heretofore unknown northeast of Plum Island and the famous Round Pond at Tewksbury (Massachusetts), where it is one of a very notable group[2] of isolated coastal plain plants; and, best of all, the tiny bladderwort, *Utricularia subulata*, both the showy form with expanded orange corollas and the cleistogamous state with minute creamy or whitish flowers; for *Utricularia subulata* is one of the most characteristic plants of wet barrens all the way from Brazil, via the West Indies, to southern New Jersey, north of there an exceedingly rare species, known from a single station on Long Island and very locally indeed on Martha's Vineyard, Nantucket and Cape Cod (fig. 4). This was indeed pretty thrilling and our excitement, as we were shown one after another the different finds, quickly stimulated the curiosity of the brakeman, who stopped for a lesson in a subject obviously quite new to his experience.

In his account of the distribution of forest trees of Canada, Robert Bell stated that the northern White Cedar, *Thuja occidentalis*, "is absent from . . Nova Scotia;"[3] and in his enumeration of the trees of Nova Scotia, Fernow[4] does not list the species. But in

[1] Many botanists maintain as distinct species the circumpolar *L. inundatum* and the endemic American coastal plain *L. adpressum* and *L. alopecuroides*, although in Britton & Brown's *Illustrated Flora* (ed. 2, i. 44) *L. inundatum*, var. *Bigelovii*, the type of which is quite identical with Georgia, Florida and Louisiana specimens of *L. adpressum*, is treated as a variety of *L. inundatum*: "Slender elongate forms, mainly from New England . . . ; they indicate a possible transition into the next species [*L. adpressum*]." On Cape Cod and in Nova Scotia the transition is very apparent and no sharp specific line can be drawn between *L. inundatum* and *L. adpressum*. *L. alopecuroides*, with its great development of bristly ciliation, would seem, from its more typical specimens, to be well marked, but in his *Plants of Southern New Jersey* Stone says (p. 141): "We certainly have a chain of connecting links in our New Jersey bogs between *L. chapmanii* [or *L. adpressum*] and *L. alopecuroides*." It is thus apparent that, in 1843, Tuckerman worked out the proper treatment of these plants:

"*L. inundatum* . . . .—β. *Bigelovii*, (mihi): majus, ramis subramosis elongatis, foliis acuminatis sparsim denticulatis s. integris. *L. Carolinianum*, Bigel. Fl. Bost. p. 384.—γ. *alopecuroides*, (mihi): caule ramisque ut β. foliis lineari-subulatis basi sparsimque ciliato-dentatis. *L. alopecuroides*, L. . . . (β.) Wet, sandy margins of ponds; Plymouth, Oakes and Tuckerman; (also New Jersey?).—(γ.) Florida, Torrey. . . . The variety *alopecuroides*, if this view be correct, is the extreme southern American form of the species, the variety *Bigelovii* intermediate, and perhaps not occurring north of Massachusetts, and α. the extreme northern state, common to us with Europe."—Tuckerm., Am. Journ. Sci. xlv. 47, 48 (1843).

[2] See Fernald, Rhodora, xiii. 247 (1911).

[3] R. Bell, Geol. Surv. Can. Rep. for 1879–80, 47C (1881).

[4] Fernow, Forest Conditions of Nova Scotia, 11 (1912).

Lindsay's *Catalogue* it is recorded from Cumberland County, north of the main peninsula of Nova Scotia and Professor H. G. Perry has reported it[1] as scarce in the west-central portion of the province. Lindsay also records the coastal plain Cypress or Cedar, *Chamaecyparis*, and Nichols has surmised[2] that a reputed Juniper on Digby Neck may prove to be *Chamaecyparis*. Consequently, when we discovered on Fernow's map that in Digby County there are two bodies of water called "Cedar Lake," one at the head of Tusket River, east of Corberrie, the other, lying partly in Yarmouth County, northeast of Port Maitland, and giving the name to Cedar Lake post-office, we promptly made inquiries about the tree which had suggested the name. The inquiries, as usual, were fruitless, so on the afternoon of July 11, having time for a short ride, we went by automobile to the nearer (the latter) Cedar Lake to settle the question ourselves. On the way we paid our respects to *Rubus*, especially to one ugly old brier with a profusion of fierce prickles, glands and hispidity, the dominant blackberry of the region, which was promptly dubbed by our *romantic* classicist "*filius diaboli*," a shrub strongly simulating the coastal plain *R. Andrewsianus* Blanchard but with strongly hispid as well as prickly and glandular canes.

On a roadside near Darling Lake was the small yellow clover, *Trifolium dubium*, a common weed from Cape Cod southward, afterward found by us at other stations in Yarmouth County as far south as Belleville. North of Port Maitland the road passed near the southern end of Beaver Lake and we were so attracted by the tremendous inundated swale at its border, that we felt justified in taking a few minutes from the short time available for Cedar Lake to sample it. The swale was a typical one, with a profusion of *Scirpus acutus* Muhl.,[3] *Cladium mariscoides*, *Panicum spretum*, *Carex polygama*, *Pogonia ophioglossoides*, etc., and with them the usually maritime *Triglochin maritima*, here in highly acid peat.

As we approached Cedar Lake we came upon a swale showy with *Potentilla fruticosa* which we had not seen before and which, with its predilection for neutral or even calcareous soils, suggested that if any cedar still grew in the region it would be *Thuja*. Accordingly we were prepared, as the road came close to the lake, for the beautiful

[1] See Fernald, Rhodora, xxi. 55 (1919).
[2] G. E. Nichols, Rhodora, xxi. 68 (1919).
[3] See Fernald, Rhodora, xxii. 55 (1920).

growth of *T. occidentalis* which fringes the southwestern banks of the lake. It was not so thrilling a sight as a *Chamaecyparis* swamp would have been but it definitely disposed of the tradition that *Thuja* does not grow in Nova Scotia. The belt of cedar is only a few yards wide, extremely localized, and it is probable that morainal material at that point, derived from the basaltic Digby Neck to the north, would account for this localized colony of *Thuja* in a dominantly acid region.

The lower peaty and gravelly margin and beach of the lake had the usual plants of the lake-shores: *Carex lenticularis, Lobelia Dortmanna, Eriocaulon septangulare, Isoetes sp., Panicum spretum, Gratiola aurea,* etc., with *Botrychium simplex* forming a characteristic little patch at one point in the dry gravel; trees of the coastal plain *Acer rubrum,* var. *tridens* mingled with the common northern form of the species; and abundant in the gravel were great colonies of a pale-pink *Pogonia ophioglossoides* with the perianth not expanding as it does in the plant of bogs. Upon digging specimens we found that this characteristic gravel-beach plant is almost cespitose, the root-fibres extensively creeping and sending up at frequent intervals oblong leaves or flowering stems. Closer examination showed the lip to have no beard such as is conspicuous on the lip of the common bog plant or to have the beard represented only by extremely short processes; but, although we often found the plant at other lakes, there were transitional tendencies which show that it is only varietally separable.

The next day, July 12, after getting the Cedar Lake collection cared for and the presses in order, there was time for a short afternoon's collecting, so Long and Pease walked eastward to Arcadia, Linder and I south to the salt marshes and gravel beaches at Sand Beach. Puccinellias were in their prime, tantalizingly variable in stature and aspect, from 1.5 dm. to practically 1 m. tall, with dense or lax inflorescences but in technical characters all referable to *P. maritima,* the species already collected at Digby, common on Cape Cod, but in Maine unknown east of Casco Bay. *Agropyron,* too, as on the coast of New England and about the Gulf of St. Lawrence, was perplexingly variable and the group surely needs a master's hand, for altogether too many plants, both native and introduced, are passing under the blanket-name *A. repens.* A very pretty white-flowered form of the Sea Lungwort or Oyster-plant, *Mertensia mari-*

tima, was on the barrier beach, and back of the beach were two salt-marsh coves with boreal and austral halophytic sedges wonderfully mingled: in one cove the arctic *Carex norvegica* forming a pale turf close beside a tall colony of the austral *Scirpus Olneyi*, a characteristic species of such habitats from the West Indies and northern Mexico to the coast of New Hampshire; in the next cove a similar mingling of the boreal *Scirpus rufus*, previously unknown south of Cape Breton and the Magdalen Islands, and the curious "walking" sedge, *Eleocharis rostellata*, extending north from Mexico and Cuba to Massachusetts, and heretofore unknown east of an isolated northern station in Sagadahoc County, Maine.

Long and Pease had gone a mile or so beyond Arcadia village to the shores of Porcupine Lake,[1] where in the sphagnous margin of a rill they had again found *Schizaea pusilla*, there associated with *Arethusa bulbosa* and very young specimens of a *Bartonia*. On dry gravel they had collected *Panicum subvillosum*, which soon proved to be one of the commonest species of the province, and *Antennaria petaloidea*, var. *subcorymbosa* Fernald,[2] a characteristic plant of eastern Newfoundland, Prince Edward Island and Nova Scotia, locally westward to the lower Penobscot in Maine, and found in very typical form by Bicknell on Nantucket.[3]

They also brought in very characteristic material of a tall shadbush with the young leaves densely tomentose, the mature elliptic-oblong and acute, sharply and somewhat remotely toothed and obviously not like those of *A. oblongifolia*, so common in southern New England, but with ascending calyx-lobes much as in that species. They had been collecting the same thing before my arrival and afterward we found it one of the commonest large shrubs as far east as Queens and Annapolis Counties, either in peat or gravel. This material exactly matches the numerous specimens in the Gray Herbarium which Wiegand has identified as *Amelanchier intermedia* Spach.[4] as do specimens of a characteristic tall shrub of Prince Ed-

[1] The name Porcupine Lake is applied by the people of Yarmouth County to the unnamed lake of the topographic map slightly east of Arcadia; while the next lake to the east, called Porcupine Lake on the map, is universally known as Trefry's Lake.

[2] Rhodora, xvi. 133 (1914).

[3] Bicknell, Bull. Torr. Bot. Cl. xliii. 267 (1916); xlvi. 437 (1919): "Such plants of Nantucket as . . . and *Antennaria petaloidea*, var. *subcorymbosa* would scarcely be looked for from elsewhere than far to the east."

[4] See Wiegand, Rhodora, xxii. 147 (1920).

ward Island. Wiegand treats the species as belonging to the Piedmont and Alleghenian regions from Vermont and New York to North Carolina, there occurring chiefly in bogs. Its abundance in Nova Scotia and Prince Edward Island on either damp or dry soils suggests that it may be a Canadian species which southward takes to the bogs.

We were gradually growing into the habit of spending all our mornings in the barn caring for the presses and on July 13 it was, therefore, afternoon before we got away, all five of us by automobile, with the avowed purpose of going inland to Carleton or to Kemptville. Not far from Yarmouth we were tempted by a little pondlet, dignified by the wholly undistinguishing name Lily Lake, to stop long enough to "size up" the place, a bog-pond with quaking bushy margin, where we collected for the first time *Rosa palustris* Marsh,[1] and deep in the spruce thicket immature but thoroughly characteristic *Thelypteris simulata* (Davenp.) Nieuwl. (*Aspidium simulatum*),[2] heretofore unknown east of southern Maine but afterward found to be quite general on bog-barrens, in spruce swamps or in alder-thickets as far east as we worked in the Avalonian formation (Port Mouton and Broad River). This southern fern was growing with its regular southern associates, *Carex atlantica* and *C. Howei*, and nearby were the ubiquitous *Carex bullata*, var. *Greenei*, and *Thelypteris Boottii* (Tuckerm.) Nieuwl.,[3] which soon proved to be a common fern.

The next stop was a brief one, to prospect a little about the shore of Greenville (or Salmon) Lake. The water was high but *Isoetes*, as usual wherever we went, was already well fruited; *Xyris caroliniana* was becoming really recognizable; and, abundant in the boggy thicket, where in Maine or New Brunswick we should expect *Galium trifidum*, was the larger and smoother *G. tinctorium*, again a southern species not previously known northeast of Massachusetts.

We had gone but a short distance up the west bank of the Tusket River when, at Tusket Falls, we spied an extensive tidal flat, one of those "demd damp, moist, and unpleasant" stretches of ooze and slimy mud which is always sought by the properly enthusiastic field-botanist, for here there is good collecting. The tidal flats at Tusket Falls do not equal some in New England nor those on the

[1] See Fernald, Rhodora, xx. 91 (1918).
[2] See Weatherby, Rhodora, xxi. 174, 178 (1919).
[3] See Weatherby, Rhodora xxi. 174, 177 (1919).

lower Delaware, but they are good, giving us *Samolus floribundus*, *Juncus acuminatus*, the first east of the tidal reaches of the Penobscot, and *Myriophyllum humile*, again the first east of the lower Penobscot.[1]

Continuing up the valley, we saw much of a Staghorn Sumach, *Rhus typhina*, but here and, as we afterward noted, at some other stations in Nova Scotia, the pubescence of the branches is remarkably short and scanty, sometimes nearly wanting. At other stations, however, the pubescence is quite as long as we find it southward, so that there seems to be no constancy in the Nova Scotia variation. Somewhat north of Tusket (or Vaughan) Lake we again came upon the Inkberry, *Ilex glabra*, which had so amazed Long and me when we found it with *Empetrum nigrum* in the bog at Meteghan. But here it was dominant over a considerable area, not of bog, but of dryish rocky barren, associated with *Vaccinium pennsylvanicum*, *Myrica carolinensis* and the same handsome *Antennaria neodioica*, var. *grandis* which we had collected at Meteghan.

Our time was used up and we had not reached Carleton, but we were content with the afternoon's work and ready to return home. On the way back from the Tusket valley we had seen at several places roadside colonies of a tall Lupine, but our driver informed us that at Chebogue Point lupines covered many acres of hillside. Accordingly, on the afternoon of July 14 we drove to the Point to see them, one of the famous sights of Yarmouth County, great masses higher than one's head of blue-violet (occasionally pink or white) lupines covering the dry roadside-banks for a tremendous distance, two thoroughly naturalized species from northwestern America, *Lupinus nootkatensis* Donn and *L. polyphyllus* Lindl., both already known[2] as naturalized plants in the Maritime Provinces, but here growing intermingled and apparently freely crossing.

On the return Bissell took home the material already collected and the rest of us walked from Rockville back to Yarmouth, Pease and Linder by the eastern shore of the Chebogue peninsula, where they found more *Eleocharis rostellata* and with it *Galium trifidum*, var. *halophilum* Fernald & Wiegand,[3] thus proving that that northern

[1] Nichols reports *M. humile* as characterizing the sandy margins of lakes on Cape Breton (Nichols, Veg. No. Cape Breton, 350) but, as he now informs me, this record was based on the common lake-margin *M. tenellum*.

[2] See Fernald, Rhodora, xvi. 94 (1914).

[3] Rhodora, xii. 78 (1910).

species is not everywhere replaced in western Nova Scotia by the coastal plain *G. tinctorium*. Long and I followed the western shore of the peninsula nearly to the point at Sand Beach where, a few days earlier, Linder and I had stopped collecting. Along spring-rills everything was luxuriant and in such a habitat we collected *Eleocharis capitata*[1] exceeding in stature and length of spikelet the ordi-

[1] Dr. S. F. Blake has shown (Rhodora xx. 23) that the Linnean *Scirpus capitatus* has been misinterpreted and that the Clayton plant upon which it was primarily based is the familiar *Eleocharis tenuis* (Willd.) Schultes. Dr. Britton (Torreya, xix. 246) doubts this identification of the type of *S. capitatus*, saying: "It seems incredible that Linnaeus could have meant to describe the spikelet of that sedge as subglobose and to have assigned the name *capitata* to it. Linnaeus reached some results which seem queer to us . . . . but these flukes are brilliant as compared with calling the spikelet of *Eleocharis tenuis* subglobose."

The Linnean description of the spikelet of *Scirpus capitatus* is, indeed, "spica subglobosa," but so is his description of the spikelet of the first species on the page (Sp. Pl. i. 48), *S. geniculatus*: "spica subglobosa." No difference between the two descriptions is apparent; nevertheless, no one, so far as I am aware, applies the name *S. geniculatus* or *Eleocharis geniculata* to any other than the tropical plant with as elongate-lanceolate or slender-cylindric a spikelet as can be found in the genus. Surely, if the latter plant, with a very elongate spikelet could be described by Linnaeus as having the "spica subglobosa," it should not seem incredible that he so described the ellipsoid to ovoid spikelet of *E. tenuis*.

In the same note in which Dr. Britton expresses his amazement at Linnaeus's description of *Eleocharis tenuis* he refers to the International Rules of Botanical Nomenclature as "forced down the throats of the Vienna Botanical Congress by a German majority and further manipulated by the same majority at the Brussels Congress," while the American Code "cuts out autocracy."

Such remarks from one of the original Commissioners who organized the Vienna Congress but who has treated the rulings of its tremendous international majority as "a scrap of paper," must seem like a huge joke to anyone familiar with the methods by which the American Code originated. The Nomenclatorial Congress at Vienna was presided over by Flahaut of Montpellier (although Dr. Britton had nominated von Wettstein), with Briquet of Geneva as *rapporteur général* (certainly neither of them Germans). There were 39 Commissioners: 4 of them from Germany, 3 from Austria and 2 from Hungary; while the remaining 30 were from non-German countries (1 from Uruguay, 2 from Belgium, 1 from Spain and Portugal, 4 from the United States, 4 from France, 4 from the British Empire, 2 from Holland, 3 from Italy, 4 from Russia, 1 from Sweden, and 4 from Switzerland); surely not a *German* majority. Nineteen authors of formally proposed motions were present, each with a single vote: 7 of them from Germany, Austria and Hungary, the remaining 12 from the United States, Switzerland, Russia, Norway, Italy, Great Britain and France; again not a *German* majority. Forty-five botanical institutions, each with a single vote, were represented: 6 German, 5 Austrian, 2 Hungarian (total 13); while the remaining 32 votes came from the following countries; Belgium 1, Denmark 1, United States 10, France 3, Great Britain 2, Holland 2, Italy 5, Norway 1, Russia 1, Sweden 3, and Switzerland 3 (total 32 as opposed to 13); again not a German majority! Seventy-two societies and academies had delegates with a total of 135 votes distributed as follows: Germany 23, Austria 9, Hungary 3 (total 35 out of 135), not an overwhelming German majority; Belgium 3, Denmark 3, Spain 4, United States 18, France 29 (more than Germany!), Great Britain 12, Holland 9, Italy 4, Norway 1, Russia 6, Sweden 2, and Switzerland 9 (total 100).

Article 20 of the International Rules, recognizing *nomina conservanda* (Art. 17*ter*, of the Texte Synoptique voted upon at Vienna), the Article so offensive to certain Americans, was adopted at Vienna by a vote of 133 to 36 (a majority greatly exceeding

nary measurements of the species, the culms being 7.5 dm. high, the spikelets 1.1 cm. long. One old springy field was brilliant with the red spires of *Rumex Acetosa* and with it was a gigantic species, at first glance taken for rhubarb, but quickly perceived to be a dock, the Butter Dock or Monk's Rhubarb, *Rumex alpinus* L., a very striking European species which has turned up casually in New England but here is thoroughly naturalized.

In a roadside ditch as we approached Sand Beach village we found a remarkable form of the ubiquitous and endlessly variable *Carex scoparia*, and when we got home we found that Pease and Linder had collected the same variation at another station east of Rockville. In this peculiar form the spikes are slenderly rhomboid and tapering to very slender, almost caudate tips.

Next day, July 15, there was time for an afternoon trip and since Bissell, Linder and I had begun to feel that "Longipes" had a tantalizing ability to turn up coastal plain specialties wherever they went and since we longed to be present at some of these thrilling discoveries, a new grouping for the afternoon seemed desirable. Accordingly when we drove eastward, Bissell, Long and Linder went to Tusket and Pease and I tried the borders of the beautiful lake erroneously called on the map "Porcupine Lake" but known throughout the region as Trefry's Lake.[1]

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the Germanic vote) and the Commission appointed to decide on the list of *nomina conservanda* consisted of Bonnet (French) Britton (American), Harms (German), Prain (British) and Briquet (Swiss)—again far from a *German* majority.

The same situation is obvious to anyone who sufficiently cares for the facts to read the records of the Brussels Congress. Flahaut (French) was again president, with de Wildeman (Belgian) general secretary. Of the 54 members of the Permanent Bureau and the Commission on Nomenclature, 12 were Germans, Austrians and Hungarians; 42 non-Germans. Of the 15 authors of motions present and voting 4 were German, Austrian and Hungarian; the others (11) non-German. Of the 50 botanical establishments having votes, 12 were German, Austrian and Hungarian; 38 not. Of the 108 votes by delegates from Academies and Societies, 30 were cast by Germans, Austrians and Hungarians; 78 by representatives of other countries (including 19 American, 20 French and 15 British). That these facts, which are simple transcriptions from the official published records of the Congresses, most certainly do not represent the "autocracy" of an overwhelming "German majority" should be evident to everyone. For many years prior to the Vienna Congress tremendous effort was expended by those who sincerely wished to bring uniformity out of the very diverse usages of local groups of botanists. The effective foundation-work laid at Paris (German?) was subsequently carried forward with unlimited self-sacrifice and far-seeing skill by Briquet, Flahaut, Rendle and others; and the sportsmanlike or statesmanlike spirit with which the vast majority of delegates, representing all sorts of pet views, abandoned their private wishes at Vienna, is one of the most impressive signs that, although a few "Neo-Americans" present were unwilling to concede anything, the botanists of the rest of the world were working disinterestedly for agreement.

[1] See note on p. 103.

Although the water was high, there was sufficient peaty, sandy and cobbly beach exposed for us comfortably to follow the margin of Trefry's Lake. At the upper border of the beach *Utricularia subulata* was so abundant as to form an interrupted orange-yellow band and with it, as at every station we subsequently found (nearly every lake visited in Yarmouth County), was *U. cleistogama*, the extreme plant with tiny creamy or milk-white or sometimes buff-tinged, spurless corollas, but with many of the flowers intermediate in size, form and color and often with short spurs. Such transitional colonies were repeatedly examined by Long and me; White and Bean, when they came, saw the two with their intermediates at Cedar Lake where White secured a beautiful photograph including the tiniest extreme (no larger than a slender "insect-pin"); and Dr. Graves, when at last he came, had his opportunity to collect the transitional series at Salmon Lake. These repeated experiences naturally destroyed the last lingering illusions that *U. cleistogama* is a species distinct from *U. subulata*. It is not even a good variety, being merely a cleistogamous form of *U. subulata*.

Since the preceding paragraph was written it has been gratifying to find that Bicknell's experience on Martha's Vineyard was so similar to our own. "Near Edgartown, on Martha's Vineyard, on September 30, 1912, there fell to me a most favorable opportunity of observing the extent of variation natural to the flowers of *S[etiscapella] cleistogama* among the plants of a single colony. The situation was a few square feet of damp sandy soil in open ground. In the weakest examples, some of them not over 1 cm. high, the corollas, 'not larger than a pinhead,' were subglobose or saccate, and white or faintly bluish in color, precisely as descriptions require them to be. But in stronger plants the corollas increased doubly in size and came also, by an exact gradation, to a distinctly two-lipped form, the blunt lower lip dusky or purplish lineate and with an evident white spur, the most open flowers showing an unmistakable yellowish tinge. The spur, obsolete in the smallest corollas, varied in the larger ones from rounded to oblong and acutish; in one instance it was bifid."

"In very small examples of *S. subulata*, unmistakable as to identity because components of colonies of the typical plant, the corolla, perhaps from arrested development, may be somewhat abortive and

reduced to a fraction of its normal size, and is sometimes palest yellow, or even whitish with a faint bluish tinge."[1]

The thickets by Trefry's Lake have a tantalizing complex of Black Alders, *Ilex verticillata* and its varieties or allies; but one of them was so unlike the ordinary forms of the species that we collected material. This proves, as we then suspected, to be the very characteristic shrub described by Bicknell from Nantucket and Martha's Vineyard as *Ilex fastigiata*,[2] an extreme of this group with fastigiate habit and very small and narrow leaves. The same shrub was afterward seen elsewhere in Yarmouth County, and in October Linder and I collected fruiting specimens on the headwaters of the Tusket. Similarly, here as at many other places in the county, the High-bush Blueberries were baffling in their variations and in working back into the boggy thicket to do our reluctant duty by them we found ourselves in a characteristic growth of the Chain Fern, *Woodwardia virginica*, a coastal plain fern already well known from Nova Scotia but not before seen by our party, though subsequently we learned to regard it a dominant plant of boggy spruce swamps at lake-margins and sometimes even of cobble-beaches.

Coming to a point where the shore was impassible, we turned back into the spruce swamp, only to find ourselves impeded by a very familiar and unyielding obstacle, a dense tangle of the long-sought Green Brier or Cat Brier, *Smilax rotundifolia; Smilax rotundifolia* with its roots in a cold sphagnous bog, its lithe, green stems embracing the branches of the Hudsonian and Canadian White Spruce and Larch quite as contentedly as if clambering over the Tupelos and *Leucothoe* of Cape Cod. And back of the Green Brier tangle, the spruce bog, with its tussocks of the northern *Carex paupercula* and *C. trisperma* and its carpets of *Linnaea*, *Dalibarda* and *Cornus canadensis*, was almost uncanny with a dense undergrowth of Inkberry, *Ilex glabra*, now in profuse bloom and swarming with bees. Incidentally, this shrub is considered in Alabama and some other southern states the most valuable wild source of honey, and from the swarms of honey bees which cover it in Nova Scotia it is apparent that it might there be made of considerable economic use.

We had not yet learned to rely on the almost regular lateness of the west-bound trains on the Halifax and Southwestern (part of the

[1] Bicknell Bull. Torr. Bot. Cl. xlii. 341 (1915).
[2] Bicknell, Bull. Torr. Bot. Cl. xxxix. 426 (1912).

government system) and in order to catch the last train to Yarmouth were forced most reluctantly to start on the three- to four-mile tramp to Arcadia station, or, rather, walking match with Pease, the champion of White Mountain trampers, as pace-setter.

The Tusket party, of course, brought in *Ilex glabra*, a shrub the rarity of which we were beginning to doubt, and Bissell maintained that the White-fringed Orchis, *Habenaria blephariglottis* of coastal plain peats, was growing at Tusket on the ordinary, dry railroad embankment. This was a rather "jarring" assertion to those of us who knew the plant southward only in wet sands or bogs, but we afterward abundantly verified it, for from now until mid-August we constantly saw this beautiful plant with milk-white racemes in the greatest profusion, not only on wet, boggy barrens but in ordinary dry pastures, spruce thickets and dry *Polytrichum*-barrens.

Long and Linder, hoping to add to the glories of the tidal flats of the Tusket, had spent some time on the muddy banks of the river which are here decidedly more saline than farther up at Tusket Falls, the rank grasses and sedges being chiefly *Spartina alterniflora* Loisel,[1] and *Scirpus acutus*, with *Scirpus Olneyi*, *Eleocharis rostellata* and *Deschampsia caespitosa* at the brackish upper border. The mud was too saline for a great variety of species but they had their reward in *Zannichellia palustris*, var. *major*,[2] *Limosella subulata* Ives[3] and, best of all, that most amazing of all our *Umbelliferae*, *Lilaeopsis lineata*, always exciting wonder by its unique habit and habitat; the

[1] See Fernald, Rhodora, xviii. 178 (1916).

[2] In 1918 it was pointed out (Rhodora, xx. 160–164), that in America typical European *Limosella aquatica* L., although known at the Straits of Belle Isle, is mostly confined to the western sections of the continent, the plant of the Atlantic coast being *L. subulata* Ives. Similarly, the typical European *Zannichellia palustris* L. seems to occur in North America only in the western half of the continent, from Saskatchewan to Iowa, Missouri and Texas, thence west to the Pacific and south into Mexico, the plant with sessile or subsessile fruits, the body of the achene 2–2.5 mm. long. The plant of tidal or brackish pools and shores all the way from Florida to Newfoundland is var. *major* (Boenningh.) Koch, this plant having the fruit definitely pedicelled and rather long-beaked, its body 2.5–3.5 mm. long. It may have either free-swimming or closely repent stems, but throughout its range along our Atlantic coast it has the fruit-characters remarkably constant. The bibliography of our plant seems to be:

Z. palustris L., var. major (Boenningh.) Koch, Syn. Deutsch. und Schweiz. Fl. 679 (1837). *Z. major* Boenningh. ex Reichenb. in Moessler, Handb. ed. 2, iii. 1591 (1829); Reichenb. Ic. Bot. Crit. viii. 24, fig. 1005 (1830) and Ic. Fl. Germ. Helv. vii. 10, t. 16, fig. 24 (1845). *Z. intermedia* Torr. Compend. 330 (1826). *Z. palustris* Race *Z. dentata*, β. *major* (Boenningh.) Rouy, Fl. Fr. xiii. 298 (1912).

[3] See Fernald, Rhodora, xx. 160–164 (1918); also Pennell, Torreya, xix. 30–32 (1919).

stems creeping in saline mud, the leaves being erect and fleshy club-shaped bodies 2–8 cm. high. *Lilaeopsis* is one of those interesting genera of a few closely related species and a range southward through South America, but in the eastern hemisphere known only in Australia and New Zealand. But in case of the Tusket plant the usual thrill of finding this unique little plant was intensified by the knowledge that it is an addition to the flora of Canada.

Friday, the 16th, brought White in the morning by boat and Bean in the afternoon by train and an appropriate initiation was provided by setting them to work changing driers and "salivating"[1] specimens preparatory to an early start next day on a long circuit, to see the country along the southwest coast as far as Halifax and to explore various spots already noted from there to Amherst on the New Brunswick border, and westward into Annapolis County. The trip started auspiciously on the 17th, with the party increased to seven, and, as we watched the country from both sides of the train, we were "all eyes," noting countless promising barrens, lake-shores and sands for future exploration.

(To be continued)

SIUM SUAVE: A NEW AND AN OLD FORM.

NORMAN C. FASSETT.

SIUM SUAVE Walt. forma **fasciculatum,** forma nova, repens vel suberectum; foliis imis ad foliolum terminale solitarium 1–3 cm. longum reductis, petiolis valde elongatis 1–2.5 dm. longis, foliis caulinis plerisque secundariis etiam pinna solitaria terminale parva (4–17 mm. longa) suborbiculari instructis in axillis primariis fasciculatis a basi cormiforme ovoideo-subglobosa saepe 5 mm. diametro orientibus.

[1] The "salivation" of specimens is a simple, but apparently not generally known, method of securing superior results. In my own experience, at least, the method originated impulsively at Carleton, Quebec, in July, 1904, when Collins, Pease and I were distressed at the failure of flowers of *Parnassia* and leaves of *Pinguicula* to stay opened out after the plants had received their first pressure. Impulsively tearing off a bit of newspaper and moistening it with my tongue, I applied it to the curling petals and leaves with the instant result that they were held closely to the pressing paper. These bits of paper, promptly dubbed SALIVATORS and when needed in quantity moistened in a dish of water, are now considered indispensable by those who have learned the trick and by their use nearly all obstinately curling portions of a specimen can be held in place. The slips are left in press during successive changes of driers and eventually flake off. A modification of the method is to moisten a spot on the pressing sheet when the specimen is originally put in press and on this wet spot to spread out (up-side-down) the refractory petals or leaves.

Repent or somewhat erect: basal leaves reduced to a single leaflet, 1–3 cm. long, lanceolate to ovate, coarsely serrate; petioles conspicuously elongate, 1–2.5 dm. long: cauline leaves usually consisting of the terminal leaflet, 4–17 mm. long, suborbicular to ovate or lanceolate-elliptical, fascicled from the axils of the primary leaves and rising from an ovoid to subglobose corm often 6 mm. in diameter. MAINE: tidal mud-flats of the Cathance River, Bowdoinham, September 14 and 19, 1916, *M. L. Fernald & Bayard Long*, no. 14,241 (TYPE in Gray Herbarium); tidal estuary of the Cathance River, Bowdoinham, August 25 to 31, *N. C. Fassett*.

Although the leaves of *Sium suave* Walt. are frequently variable as to size and shape, this form is clearly marked and different from any other material to be found in the Gray Herbarium. Growing in

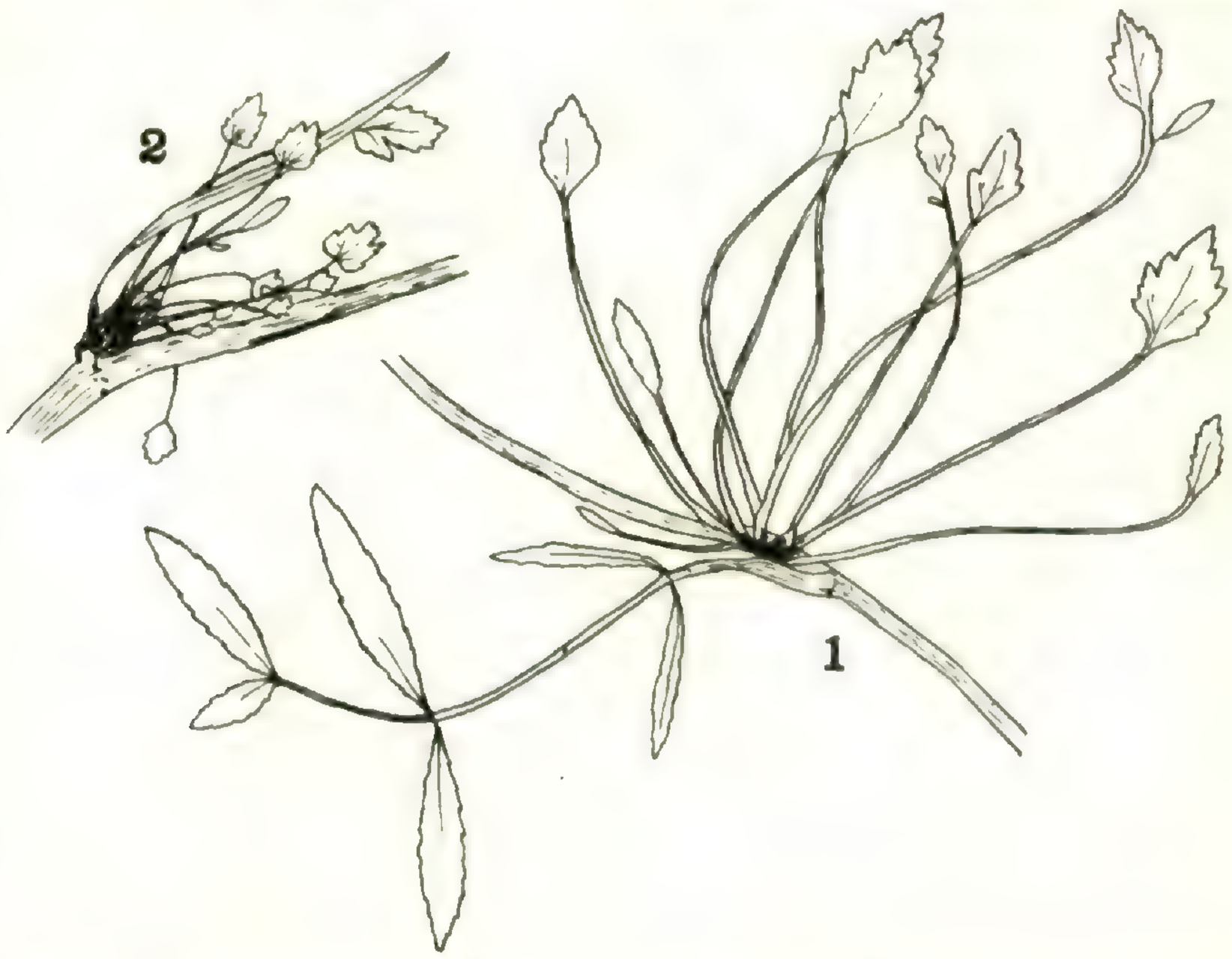

Fig. 1. Sium suave, f. fasciculatum, a node showing pinnate primary leaf. ×½.

Fig. 2. A node of same form, with primary leaf reduced to a lance-linear blade, showing a corm in the axil. ×½.

the soft mud of Cathance River, and covered twice a day by fresh water, it sends up at the nodes clusters of half a dozen or more leaves, most of which are reduced to rounded terminal leaflets. These appear to be secondary leaves, and rise from the axils of the primary ones, which are sometimes normal (Figure 1), or reduced to one leaflet which is elongate and inconspicuous (Figure 2). In the more extreme forms the secondary leaves rise from rather conspicuous hardened corms, which at once suggest bulbs, but the writer could find no evi-

dence of their ever becoming detached from the parent plant to act in any reproductive function.

The fruit of the form varies; many plants have normal full-grown carpels, while in others they are small, half-developed, and resemble those of *S. Carsonii* Durand.

It might also be well to add that the stem is much more fragile than in the common forms, and it is so brittle especially at the base that it was difficult, even in the soft mud of the tidal flats, to pull up the plants by the roots without breaking them at that point.

At a few places on the estuary were clumps of *S. suave* which grew so that the individuals were partially supported by the dense vegetation, and these tended less to take on the form with fascicled leaves, and showed a gradual transition into the typical form of the species. But whether or not the development of this form has any direct relation with the degree of recumbence cannot be stated with any degree of certainty.

Sium Carsonii Durand is apparently merely a weak aquatic state of *S. suave*, and should be considered as a form, likely to occur anywhere throughout the range of the species as a response to submergence.

SIUM SUAVE Walt. forma **Carsonii** (Durand), comb. nov. *S. Carsonii* Durand in Gray, Man. ed. 5, 196 (1867). *S. cicutaefolium* Schrank var. *Carsonii* (Durand) Eames, RHODORA, xviii. 239 (1916).

HARVARD UNIVERSITY.

REPORTS ON THE FLORA OF THE BOSTON DISTRICT,—XXXIV.

[There is an insignificant specimen of *Mentzelia* in the Club Herbarium collected in Boston by C. E. Perkins in 1882. There are also records of *Opuntia vulgaris* Mill. by John Robinson, Fl. Essex Co., 55, 1880, but apparently the plants were introduced and not persistent.]

THYMELEACEAE.

DAPHNE.

D. MEZEREUM L. Spontaneous or persistent at Ipswich, Salem, and Medford.

DIRCA.

D. palustris L. Open woods, Salisbury (*J. H. Sears & Edward Moulton*, May, 1887); Newburyport (*Edward Moulton*, May 20, 1889). Specimens in herb. Peabody Acad. Sci.

LYTHRACEAE.

CUPHEA.

C. PROCUMBENS Cav. One plant in high wet pasture, Andover (*M. E. Gutterson*, Sept. 22, 1901). Specimens in herb. Gray and Peabody Acad. Sci. See RHODORA iv. 247–8, 1902. A species of southern Mexico.

DECODON.

D. verticillatus (L.) Ell. Shallow water, frequent near the coast.

D. verticillatus (L.) Ell., var. **laevigatus** T. & G. See RHODORA xix. 154–5, 1917. Shallow water, rather common.

LYTHRUM.

L. ALATUM Pursh. A fugitive plant at Melrose, Chelmsford, Lexington, Cambridge, Boston and Needham.

L. Hyssopifolia L. Edges of salt-marshes and sand dune hollows all along the coast.

L. SALICARIA L. Introduced in wool-waste at many places; especially abundant along the Merrimac River and between Ashland and Framingham.

L. SALICARIA L., var. TOMENTOSUM (Mill.) DC. Georgetown, Danvers, Chelmsford, Franklin.

L. VIRGATUM L. Casual in vacant lots at S. Boston (*C. H. Knowlton & W. P. Rich*, July 29, 1908); abundant in marshes by mill-stream below Canton Junction (*C. H. Knowlton*, Sept. 27, 1908); Sharon (*S. F. Poole*, September, 1905); Dorchester (*J. R. Churchill*, Sept. 2, 1916).

ROTALA.

R. ramosior (L.) Koehne. Sandy and gravelly shores of ponds; Danvers, Woburn, Winchester, Waltham, Sudbury, Wellesley, Needham, Sharon, Wrentham.

MELASTOMACEAE.

RHEXIA.

R. virginica L. Meadows, common throughout, except perhaps in some of the western towns.

ONAGRACEAE.

CIRCAEA.

C. alpina L. Frequent in northern Massachusetts; southward rare, mostly in *Chamaecyparis* swamps.

C. latifolia Hill. See RHODORA xvii. 223, 1915. Moist woods, common.

CLARKIA.

C. PULCHELLA Pursh. One plant near wool-waste dust, Arlington Mills, Lawrence (*John A. Collins, Jr.*, June 14, 1900). See RHODORA iii. 92, 1901.

C. RHOMBOIDEA Dougl. Wool-waste, N. Chelmsford (*W. P. Alcott*, 1878). Specimen in herb. Peabody Acad. Sci. Adventive from Pacific coast.

EPILOBIUM.

E. angustifolium L. Dry soil and clearings; common, but not so abundant as farther north.

E. angustifolium L. forma **albiflorum** (Dumort.) Haussk. Rocky bank, Stoneham (*W. P. Rich*, July 23, 1894). Specimen in herb. N. E. Botanical Club.

E. coloratum Muhl. Wet places, common throughout.

E. densum Raf. Swamps, common.

E. glandulosum Lehm., var. **adenocaulon** (Haussk.) Fernald. See RHODORA xx. 35, 1918. Wet places, frequent.

E. HIRSUTUM L. Waste places, rare; Salem, Winthrop, Cambridge, Roxbury, Boston.

E. molle Torr. Meadows in Essex County only, at Newburyport, Haverhill, Wenham, Danvers, and Rowley.

E. palustre L. Cedar Pond, Peabody (*J. H. Sears*, July 30, 1886; *E. Faxon*, Aug. 25, 1891); Wilmington, dark *Chamaecyparis* swamp near Lowell Junction (*A. S. Pease*, Aug. 7, Oct. 3, 1903).

E. palustre L. var. **monticola** Haussk. Bogs and wet meadows, rare; Lexington, Melrose, Medford, W. Roxbury, Milton, Easton.

GAURA.

G. BIENNIS L. Rubbish heaps, Cambridge (*W. Deane*, Aug. 5, 1886; *M. L. Fernald*, August, 1891); Lexington (*W. B. Brown, Jr.*, Sept. 11, 1896).

LUDVIGIA.

L. alternifolia L. Moist soil, occasional.

L. palustris (L.) Ell. Ditches and wet ground, common throughout.

L. polycarpa Short & Peter. Wet shores of Round and Winter Ponds, Winchester (*Wm. Boott*, October, 1885; many other collections to date).

L. sphaerocarpa Ell. Marshes along Concord River; also Waltham (*C. E. Perkins*, Aug. 4, 1881).

OENOTHERA.

O. biennis L. Rich soil and waste places, common.

O. BISTORTA Nutt. Wool-waste, N. Chelmsford (*W. P. Alcott*, June 23, 1879). Specimen in herb. N. E. Botanical Club. A Californian plant.

O. GRANDIFLORA Ait. Escaped or persistent in Essex County and at Malden, Lexington and Dorchester.

O. hybrida Michx., var. **ambigua** Nutt. (*O. fruticosa* L.) See RHODORA xx. 51–52, 1918. Single specimens have been reported from Beverly and Framingham; Cambridge (*E. Tuckerman, Jr.*, no date.).

O. LACINIATA Hill. An occasional weed, spontaneous from further west.

O. Oakesiana Robbins. Cohasset (*N. T. Kidder*, July 21, 1886). Specimen in herb. Gray.

O. muricata L. Sandy soils and waste places, common and variable.

O. cruciata Nutt. Dry soil, rare; Rockport, Wenham, Chelmsford, Woburn, Lincoln.

O. pratensis (Small) Robinson. Dry soil, rare (*E. R. Farrar*,—1891); Needham (*T. O. Fuller*, June 23, 1889); Walpole (*C. H. Knowlton*, June 27, 1909).

O. pumila L. Fields, very common throughout.

HYDROCARYACEAE.

TRAPA.

T. NATANS L. In Concord and Sudbury Rivers at Concord and Bedford, introduced by Minot Pratt; Fresh Pond, Cambridge (*Thomas Morong*, Aug. 11, 1879); Belmont (*C. E. Perkins*, September, 1882); reported at Malden and Medford according to Dame & Collins, Fl. Middlesex Co., 37, 1888.

HALORAGIDACEAE

MYRIOPHYLLUM.

M. alterniflorum DC. Westford (*Miss E. F. Fletcher*, Sept. 2, 1902); Mystic Pond (*Wm. Boott*, Aug. 26, 1853; Aug. 6, 1865); Sprague's Pond, Readville (*C. E. Faxon*, no date); by spring in mud, W. Quincy (*W. Deane*, June 10, 1894). Southern limits of the species.

M. exalbescens Fernald. (*M. spicatum* of Gray's Manual, not L.) See RHODORA xxi. 120–122, 1919. Rivers and ponds, occasional north of Boston.

M. humile (Raf.) Morong. Wet shores in mud and sand, frequent.

M. humile (Raf.) Morong. forma **capillaceum** (Torr.) Fernald. Submersed in water of ponds, frequent.

M. humile (Raf.) Morong, forma **natans** (DC.) Fernald. In shallow water, occasional.

M. tenellum Bigel. Ponds, occasional.

PROSERPINACA.

P. intermedia Mackenzie. See TORREYA x. 250, 1910. Meadow border, Lake Massapoag, Sharon (*E. F. Williams & W. P. Rich*, Sept. 10, 1899). Specimen in herb. N. E. Botanical Club.

P. palustris L. Swamps and ditches, common throughout.

P. pectinata Lam. Tophet swamp, Carlisle (*C. H. Knowlton*, Sept. 6, 1902); ditch between Hammond pond and Chestnut Hill Station (*W. Boott*, June, 1855); meadows by river, Blue Hill Reservation (*N. T. Kidder*, Aug. 12, 1894); Hingham, according to T. T. Bouvé, Botany of Hingham, in History of Hingham, i. pt. 1, 105, 1893.

ARALIACEAE

ARALIA.

A. hispida Vent. Dry sandy soil, especially in clearings, common.

A. nudicaulis L. Dry woods, very common throughout.

A. nudicaulis L. var. **elongata** Nash. Needham (*K. M. Wiegand*). See RHODORA xii. 39, 1910.

A. racemosa L. Rich woods, occasional, especiallyno rthward.

PANAX

P. trifolium L. Rich moist woods, frequent throughout.
C. H. KNOWLTON, WALTER DEANE } *Committee on Local Flora.*

A FORM OF ILEX OPACA.—That the North American holly (*Ilex opaca*) sometimes occurs in a form with entire or nearly entire leaves has long been known and occasionally commented upon. No one, however, appears to have given this form even a horticultural name. This is perhaps partly because our species has been much less cultivated than the European *I. Aquifolium* and its variants are correspondingly less well known; and partly because of an apparently prevailing impression that the entire leaves occur mainly on the upper branches of otherwise typical trees.[1] Similar statements have been made in regard to the European holly and have given rise to a pretty theory that leaves within reach of grazing cattle bear spines, but that when they attain a safe altitude they divest themselves of this unfriendly armament.

Dr. L. C. Jones, of Falmouth, Mass., has recently been investigating the form of our holly with sub-entire leaves, as it occurs in his region, and has kindly communicated notes and specimens to the Gray Herbarium. He finds that in two well-grown and mature trees (15–20 feet tall and 3–4 inches in diameter at the base) which he observed among some thirty individuals of the ordinary type, the foliage is of uniform character throughout. Some of the leaves are quite entire, others have a very few, irregularly scattered spiny teeth;[2] both kinds grow together on the same branches in all parts of the tree. Dr. Jones notes further that "the leaves of these two trees appeared thicker and more opaque than those on the trees of the common variety and the effect in the mass was to give them a duller and darker shade of green, as if a little black or dark brown had been stirred into the pigment."

Examination of fruiting specimens of the Massachusetts plants and of like flowering ones from the South discloses no distinctive characters other than those of the leaves. Entire-leaved forms of

[1] See Sargent, Sylva N. Am. i. 107, and Mellichamp, Bull. Torr. Bot. Club viii. 112, whom Sargent quotes.

[2] The usual form has 3–7 spiny teeth rather regularly disposed on each side of the leaf.

Ilex Aquifolium have been known in cultivation for many years (e. g., var. *laurifolia* Hort.); the form of *I. opaca* in question appears to be analogous to them. Dr. Jones's observations show that it may become clearly segregated in the wild; since it is a striking variant and likely to attract attention, it is, perhaps, well that it should have a name. It may be called:

Ilex opaca Ait., forma **subintegra** f. nov., foliis integris vel sparsissime spinoso-dentatis. Leaves entire or with a very few scattered spiny teeth.—On a knoll, in sandy loam among white oaks and birches, Mashpee, Mass., January 16, 1921, *L. C. Jones* (type in Gray Herb.).

Specimens referable to this form have been seen from South Carolina, Florida and Mississippi; it is, no doubt, to be expected wherever the species occurs.—C. A. Weatherby, Gray Herbarium.

The American Variations of Silene acaulis.—Practically a century ago that wonderfully keen student of the flora of Newfoundland and the adjacent regions, Bachelot de la Pylaie, had in preparation a very detailed *Flore de Terre-Neuve, St. Pierre et Miclon*, a work which, on account of his untimely death, was never published. The manuscript of this work is preserved at the Jardin des Plantes in Paris and in it la Pylaie proposed many American plants as new species or varieties,—plants which, naturally, have subsequently been detected and published by others. One of the novelties proposed by him was the plant which has generally passed in northeastern America as *Silene acaulis* L. La Pylaie, giving it a name which if now published would merely add to synonymy, distinguished it from true *S. acaulis* of Europe by "floribus breviter pedunculatis, caespite vix emersis . . . capsulis calyce paulo longioribus"; true *S. acaulis* having, as he said, "les capsules . . . deux fois aussi longues que le calice" and the peduncle usually equalling or exceeding the latter.

In this case, although la Pylaie thought he had a new variety, his plant was, as it now proves, identical with a generally recognized variety of arctic and alpine regions of Europe, var. *exscapa* (All.) DC.; and in 1868 Rohrbach in his *Monographie der Gattung Silene* pointed out that our plant belongs to this variety. The bibliography is as follows:

S. ACAULIS L., var. EXSCAPA (All.) DC. Fl. Fr. iv. 749 (1805). *S. exscapa* All. Fl. Pedem. ii. 83, t. 79, fig. 2 (1785); Jordan, Obs. Fl. Pl. Fr. v. 36, t. 1, fig. C (1847). *S. acaulis*, δ. *parviflora* Otth. in DC. Prodr. i. 367 (1824). *S. polytrichoides* Zumaglini, Fl. Pedem. ii. 269 (1860). *S. acaulis*, lusus 2, Rohrb. Gatt. Silen. 144 (1868).

The calyx of var. *exscapa*, as it occurs in northern regions of America, south to New Hampshire and Montana, is 4–6 mm. long and the barely exserted capsule is ovoid. In the Rocky Mountains, from Wyoming to New Mexico and Arizona, however, there occurs another variety with the slender tubular calyx 7–11 mm. long, as in typical *S. acaulis* of Europe, but with the cylindric capsule only slightly if at all exserted. This is

S. acaulis, var. **subacaulescens** (F. N. Williams), n. comb. *S. acaulis*, forma *subacaulescens* F. N. Williams, Journ. Linn. Soc. xxxii. 101 (1896).

In defining this variety as a form, Williams merely said: "subacaulescens, foliis anguste linearibus 25–35 mm.," thus implying that the plant is only a trivial form; but since it has more important characters of its calyx and capsule—the long calyx as in typical *S. acaulis*, the capsule essentially as in var. *exscapa*—and a distinct range it is evident that it is a well-defined geographic variety. Var. *subacaulescens* may be densely cespitose, with leaves only 6 mm. long.—M. L. FERNALD and HAROLD ST. JOHN, Gray Herbarium.

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RANGES OF NOVA SCOTIAN PLANTS

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Rhodora

JOURNAL OF

THE NEW ENGLAND BOTANICAL CLUB

Vol. 23. June, 1921. No. 270.

OLD-TIME CONNECTICUT BOTANISTS AND THEIR HERBARIA,—II.

C. A. Weatherby.

Joseph Barratt—Biographical information about Barratt is not altogether easy to come by. He died an old man, poor and with no near relatives within reach. His effects were mostly handed over to his landlord to satisfy a debt and were sold or destroyed as they appeared to have value or not. All that remains of his personal papers are a few odd slips on which he was accustomed to jot down accounts of any events which seemed to him of especial interest, and a small note-book into which he copied some of these slips, together with a table of dates. From these, from a series of his letters to Dr. Torrey during the years 1827 to 1846, now preserved at the New York Botanical Garden, from references to him in botanical works of his contemporaries and from the local newspapers of his time, it is possible to patch together some outline of his life and to gain some notion of what manner of man he was.

The figure which results has about it a certain air of failure. He had, one feels, an opportunity. He was a man of real learning, good natural powers of observation and large enthusiasm and industry and had the impulse and desire for original work. He gathered an excellent library, and was the acquaintance or correspondent of some of the best botanists of his time. He lived in a region of considerable botanical interest, then practically unexplored. He ought, it seems, to have been, if not a Muhlenberg or a Torrey, at least another Darlington or Bigelow. In geology, his chance was as good. Yet he is remembered today by the older residents of Middletown as a rather amusing eccentric who was wont to go clambering about the

Portland quarries with a pencil hung about his neck on a string and his hands full of great sheets of brown paper, on which he made strange drawings of marks in the stone. His memorials are an author-citation or two in current manuals, an occasional reference, not disrespectful, in works on special groups, a half-dozen little-known pamphlets—and a place in John Fiske's essay on "Some cranks and their foibles." His herbarium is probably his most solid and valuable achievement.

Various elements may have contributed to the meagerness of his accomplishment. One was his multiplicity of interests. By profession a physician and teacher, plants, insects and birds, chemistry, mineralogy and meteorology, local history, Indian antiquities and language, and finally geology, engaged his interest by turns and detracted one from another. Lack of money for publication and resultant discouragement may have had their effect. But, looking through what remains of his work, one seems to find a deeper reason —a certain inconclusiveness, a lack of selective and co-ordinating faculty. When he is not supported by the definite structure of a systematic botanical arrangement his articles have a way of trailing off vaguely at the end. He does not finish. That is the usual fate of a mind such as we may suppose his to have been—keen, but disorganized, better at observation than at correlating and interpreting its results.

Joseph Barratt was born at Little Hallam, Derbyshire, England, January 7, 1796.[1] His immediate family seems to have been large, for he mentions four brothers and a sister, and of ancient descent, since he records finding "particulars respecting his ancestors" in the Domesday Book. In 1810, he began the study of medicine at London and in 1816 was practising at Leicester. In 1819, for what reason he does not state, he left England for the United States, sailing from Liverpool on the ship Remittance, Capt. Silas Holmes.

The voyage to New York lasted seven weeks. Soon after his arrival, he went to Philipstown, N. Y., where he settled down to the practice of "physic" and the botanical exploration of the surrounding country. To the usefulness of the latter work Torrey pays special tribute in the preface to his Flora of New York; and he might

[1] This is the date given by Barratt himself in his fragmentary diary. The inscription on his tombstone gives 1797, and the printer of the Catalogue of Connecticut Plants has generously made it 1707.

have done as much for the former, since Barratt in his capacity as a physician brought him safely through a fever. Barratt had made his acquaintance in 1822 and for more than twenty years remained his correspondent and occasional visitor.

In July, 1824, Barratt went to Norwich, Vermont, to teach in the Academy, or, as he calls it, the "Scientific Institution" there. He promptly took advantage of his comparative nearness to the White Mountains to visit them and ascend Mt. Washington, September 18, 1824.[1] In September, 1825, he returned to Philipstown and resumed practice. That autumn he, in company with Torrey, visited Schweinitz at Bethlehem and, he records, first heard "that admired hymn, 'On Greenland's Icy Mountains.'"[2]

In May, 1826, Barratt became "professor of botany, chemistry and mineralogy in Capt. Alden Partridge's Military Academy" at Middletown, Connecticut. There, with occasional brief absences—one a visit to Niagara—he remained resident for the rest of his long life. At first he devoted himself wholly to teaching, but when the academy closed in 1828, again turned to medicine. For the next twenty-five years we get occasional glimpses of him as a successful physician, a well-liked man, a guest "eagerly sought for" and an active citizen,[3] interested in the history and such of the doings of the place as touched his tastes and abilities. He relates with some pride that he was among the first to be presented to Daniel Webster when that great man visited Middletown. We find him proposing a plan for re-stocking the Connecticut River with salmon; serving on a commission to investigate a boiler explosion; one of the jury of awards on gardens at the local agricultural society's annual fair; addressing the Farmers' Club on fertilizers, grasses, the cultivation of gooseberries and the like subjects; and inducing two of its members to try raising *Lolium perenne* as a forage grass.[4] He was a vigorous advocate of cheap postage. Toward 1845 he became interested in

[1] One incident of this journey Barratt related with gusto to Torrey in after years. "That coarse, long-legged fellow . . . . Crawford," he wrote, "laughed at the idea of my enduring fatigue, but I gave him such a walk over the mountains, taking him about thirty miles in one day, that he will not soon forget. I tired him out and had to send a horse for him."

[2] The preposition suggests that the enunciation of singers, in those days as now, was not always perfect.

[3] He was naturalized in 1830 and made a voter in the following year.

[4] The experiment seems not to have been a great success; at least, ray grass has not displaced timothy in the hay-fields about Middletown.

the local history and the customs, and especially the language of the Indians. Two items on the brief list of his publications are devoted to this subject. Doubtless this interest led to his appointment as one of the committee in charge of the celebration of the bicentennial anniversary of the settlement of Middletown in 1850.

But his scientific interests seem never to have been quite forgotten. In 1835 we hear of him as in charge of a class in botany at Wesleyan University, then recently started, and as one of the founders and the president of a college scientific society. In 1836 he wanted to give up practice and go as naturalist with the Wilkes exploring expedition and applied for the place in competition with Asa Gray. He kept meteorological records, investigated the dates of late and early frosts and the length of the growing season, and the effect of rain-fall at the flowering time of fruit trees on the subsequent crop. He made observations on the spring floods of the Connecticut River and suggested a method of measuring their height very similar to that now in use. He studied the rocks of the region and planned to compile a catalogue of minerals occurring in them. The local papers contain letters from him on all these subjects—as frequent, one suspects, as the editors would allow.

His final, and fatal, interest was in geology. He had the misfortune—for him—to live at the edge of the triassic sandstone of the Connecticut Valley and near quarries where, in the course of their work, tracks of animals and other fossils, in which these rocks are rich, were often uncovered. These things fired his imagination —over-stimulated it, indeed. He began to see in them what no one else could discern—vestiges of warm-blooded animals, ostriches kangaroos[1] and the like; the impression of a hairy belly where some quadruped had crouched; finally the foot-prints of man. It was a special kind of man with four toes only and Barratt christened him *Homo tetradactylos*. With little evidence but his own surmises to go upon, he concluded that these rocks were not Triassic but Eocene and that in that age, some millions of years earlier than other geologists would allow, man and warm-blooded animals had appeared together. From the seemingly insignificant circumstance that their tracks were contiguous, he argued that *Homo tetradactylos* had domesticated the monsters of his time and used them for his convenience.

[1] He remarks that large birds and kangaroos lived together then as now in Australia.

So important a period, he felt, should have a special name and he coined for it the resounding title of "Kalorimazoic." In his last publication, a little pamphlet issued in 1874, Barratt sets forth his conclusions and so anxious is he that his newly delimited age and its name shall have due emphasis that, whenever that name occurs in his discourse, he prints it in large capitals and on a line by itself.

It is said that as early as 1845 Barratt exhibited drawings of putative human foot-prints at a geologists' meeting at New Haven. As his theories developed and grew wilder, ridicule was the natural result. There was one grotesque incident when, refused a hearing at a convention of geologists, he somehow, at night, got into the hall where they were to meet and covered the face of the gallery with an impromptu frieze of his drawings, which were to greet the assemblage in the morning, mutely convince the sceptical and confound him whom he esteemed his chief rival, Edward Hitchcock.

Two brief quotations may serve to give some notion of the man in his later years. His geological interests, says the writer of an unsigned newspaper obituary, "became his one object in life. His business was neglected and his many friends, and his room became one grand museum, whose walls and tables were covered with drawings, specimens and relics of all kinds. Twenty years ago he interested and amused by turns any group that he could get to listen to him." John Fiske describes him as a courtly and lovable "gentleman of the old stripe." He lived, at this time, in rooms over a drug store in an old building which still stands on Main Street in Middletown. In them, says Fiske, there was such confusion as "has not been seen since this fair world weltered in primeval chaos—specimens of all kinds, chemical apparatus, books and papers sprawling and tumbled all about. . . . . Never did he clear a chair for me without an apology, saying that he only awaited a leisure day to put all things in strictest order. . . That day never came."

Toward the end, Barratt's mind gave way; he died in the hospital for the insane just outside of Middletown, January 25, 1882. He never married. He is buried in Indian Hill Cemetery in Middletown and over his grave has been placed an irregular block of his beloved Portland sandstone containing two bits of fossil tree-trunk—symbolic at once of his botanical and geological interests.

(To be continued.)

AN UNUSUAL FORM OF HABENARIA CLAVELLATA

EDWARD A. EAMES.

(Plate 131.)

To those of us having an acquaintance with some particular plant family, it is always pleasing to detect a strange feature or some unusual development in a member of that group. Any departure from type, in color, form or arrangement of the parts, is always interesting and receives close attention. I believe such abnormalities as these are caused by some temporary, accidental influence. They seldom occur in numbers, among plants in their natural environment, and usually they are quickly submerged and lost in succeeding generations.

However, there are depatures from type which occasionally prove to be of more importance. If the new character or feature is persistent and becomes established, and the plant proves capable of reproducing this new character, a true variety has been established.

Having devoted considerable attention to the orchid family for a number of years, it is but natural that in the course of many days in the field in search of my favorite plants, I have happened upon a number of cases of temporary variation from normal. I have seen *Arethusa bulbosa* with its blossom pure snowy white instead of the usual deep magenta color; I have seen *Microstylis monophylla* with two apparently normal leaves instead of the single leaf from which it receives its specific character and I have seen *Listera australis* in one colony where its colorless lip was almost transparent, and in another colony where the rich mahogany-red color of the lip made the plants comparatively conspicuous. Such abnormalities, of which the foregoing are but examples, are well known among botanists of course, and are mentioned here only to illustrate the *kind* of variation which seems to involve no fundamental change in the plant. They are analogous perhaps, to cases of albinism, or cases of more than the usual number of fingers, in human beings.

But what can be said about a variation from normal, in a certain orchid which I came upon early last August, near Damariscotta, Maine, in which the abnormality took the form of *a new shape and structure of one of the parts of the blossom, and was found to be typical of a considerable portion of all the plants throughout a large area?* In this

district I found a tract which was roughly a half a mile long and a quarter of a mile wide, containing small scattered colonies of *Habenaria clavellata* in full bloom. A careful examination of more than one hundred plants throughout this area, showed that the blossoms of at least one fourth of them (probably more) had the end of their spurs divided into two distinct divergent lobes. The accompanying plate (131) shows this peculiarity so clearly that no further description is needed. The three specimens, which by no means represent extreme cases, are shown approximately full size.

This departure from the usual form of spur in this orchid is so unusual, if not actually unique, and so different in *kind* from the examples mentioned above, that it seems to me to be not only of considerable interest in itself, but worthy of record. Indeed, from the abundance of such plants at this station, I am inclined to wonder if this peculiarity may not be expected to continue to appear in their succeeding generations. If this should prove to be the case, it may then be reasonable to consider whether they do not constitute a true variety.

In this connection, it seems to me to be well worth while to learn whether this division of the spur-tip is persistent or not in this locality, and to this end I would be very glad to hear from some local botanist who would be willing to report on these plants next summer.

Buffalo, New York.

THE SOIL REACTIONS OF SPIRANTHES CERNUA AND ITS RELATIVES.

Edgar T. Wherry.

In "Observations on the soil acidity of Ericaceae and associated plants in the Middle Atlantic States", [1] the range of *Spiranthes cernua* (*Ibidium cernuum*) was given as from specific acidity 300 to 3, with optimum at 30. This is an unusually wide range for a single species (or variety), and it was suspected that the plants tested might not all be the same, although no opportunity for studying them more critically came to the writer. The matter has now been cleared up by Mr. Ames' recent article, "Notes on New England orchids,—I. Spiran-

[1] Proc. Acad. Nat. Sci. Phila., 1920, 110.

thes."[1] He finds that typical *Spiranthes cernua* grows in association with Calopogon and Arethusa, in "sour" soils, and in dry fields among ericaceous plants. The soils in such habitats normally range in reaction from specific acidity 300 down to 30 but only exceptionally go lower than that. This species is therefore evidently a high-acid soil plant. It may be noted, further, that its occurrence both in bogs and in dry fields shows that it, like other reaction-sensitive plants, is relatively indifferent to the water content of a soil.

Spiranthes cernua variety *ochroleuca* he states to grow, on the other hand, in "woodlands and rich upland pastures," which are likely to show a specific acidity of 10 or less. It appears, therefore, that this variety is a low-acid soil plant. The writer has found it in bogs as well as in woods, so that it also is indifferent to wetness or dryness. The reaction relations of the two plants may be brought out by a tabulation according to the plan previously used; the reaction ranges of both of them are then seen to be of the order of magnitude commonly met with in individual varieties of orchids.

Specific acidity	300	100	30	10	3	1
Spiranthes cernua, typical	x	x	x	?	–	–
var. ochroleuca	–	–	?	x	x	x

Spiranthes odorata has been found to favor subacid soils, being thus intermediate in reaction between the above two. It is difficult to agree, however, with Small, Britton & Brown, and Ames, that this plant is conspecific with *S. cernua;* for where the two grow near together, as in the vicinity of Washington, D. C., they are distinct in many respects, and have, moreover, been found to retain their distinctness when grown in cultivation side by side in the same subacid soil. Some of their more striking differences are brought out by the tabulation on the next page; Schlechter notes still others.

The writer will be glad to send fresh specimens of both plants to anyone who wishes to confirm these features, during the coming September.

It would be hard to imagine two members of a single genus being more divergent; and search for intermediate forms in places where the two grow in abundance within a few hundred meters of each other has been unsuccessful. What might have been taken for an intermediate has been collected in a cat-tail marsh at Cape May, New

[1] Rhodora, xxiii, 73, 1921.

	SPIRANTHES ODORATA	SPIRANTHES CERNUA
Habitat	Tidal marsh, with Zizania, Peltandra, Bidens, etc.	Meadows, with sphagnum, *Pogonia ophioglossoides*, *Gentiana saponaria*, etc.
Soil reaction	Subacid, the decomposing vegetation being partially neutralized by calcareous river water.	Mediacid or less commonly subacid, as in typical sphagnum bogs and meadows.
Blooming time	Mid-September.	Late September to late October.
Plant habit	Up to one meter tall, with large, prominent leaves.	About 3 decimeters tall, with small, inconspicuous leaves.
Flowers:		
arrangement	In regular, slightly spiralled rows.	In rather irregular rows.
color	Dull yellowish white.	White with slight creamy tinge.
size	Up to 12 mm. long.	Around 8 mm. long.
fragrance	Extremely strong, a single spike scenting a large room.	So faint as to be detected only with difficulty.
lip	Somewhat contracted in middle, and with prominent incurved callosities.	Not contracted in middle, and with rather small, little-curved callosities.
Roots	Cord-like, tough, 8–20 cm. long, mostly tipped with a shoot which forms a new plant the following season (stolons).	Fleshy, weak, 2–8 cm. long, not observed to possess terminal shoots.

Jersey (where typical *S. odorata* is unknown), but critical examination indicates it to be merely unusually luxuriant *S. cernua* var. *ochroleuca*. A protest is therefore here raised against the reduction of our magnificent fragrant "ladies-tresses" to mere varietal rank.

WASHINGTON, D. C.

THE GRAY HERBARIUM EXPEDITION TO NOVA SCOTIA, 1920.

M. L. Fernald.

(*Continued from p. 111.*)

We were due in Halifax in the early evening and had counted on seeing the country all the way, but the chronic indisposition which seemed to afflict the government railroad reached its climax for the day in a rocky barren west of Bridgewater, with the result that we were many miles west of Halifax when darkness set it. During the very long and tedious stop in the rock-barren we had more to occupy our attention than did the hundred other travellers who had soon gathered all the early blueberries and lingering strawberries; and, although we should not recommend this area as the best place for the next breakdown, we took away the southern *Carex umbellata*, var. *tonsa* and *C. pennsylvanica*, var. *lucorum*, *Lycopodium tristachyum*, *Lechea intermedia*, and one of the neatest little shad bushes we ever saw, a beautiful shrub with stoloniferous habit, low stature (3–6 dm.) and nearly orbicular dark-green, highly lustrous leaves. Afterward, at Grand Lake, Halifax County, at Springhill Junction in Colchester County, at Middleton in Annapolis County and at various places westward we found it a thoroughly distinct and dominant shrub of barrens, either dry or wet. In habit it resembles *A. stolonifera* Wiegand,[1] a characteristic shrub from Maine to Virginia and in eastern Newfoundland, with dull and pale-green or glaucous foliage and with the summit of the ovary densely tomentose; but this characteristic Nova Scotian shrub with dark, glossy leaves has the summit of the ovary wholly glabrous, though it is sometimes arachnoid or sparsely pubescent. Typical *A. stolonifera* we found in Nova Scotia, though only once; but the common shrub is so well marked that it should be separated as a variety.

After a night in Halifax, where none of us got more than a few "cat naps," so insistent and obtrusive was the clang of the near-by fog bell, we were routed out soon after daylight to catch the "Ocean Limited" north; Bissell, Bean, White and Linder leaving the train at Truro, Long and Pease at Springhill Junction to explore barrens characterized by a scattered growth of *Pinus Banksiana* and *P.*

[1] Wiegand, Rhodora, xiv. 144 (1912).

resinosa, and I going on to Amherst. The two latter areas I had noted from the train on first reaching Nova Scotia, for they were unlike most others which I saw. The chief attraction at Amherst was a series of springy bogs and spring-fed pools by the track southward toward Nappan. In one of these pools I had seen from the speeding train a plant which upon reflection I imagined might be *Montia rivularis*,[1] a European species known in North America only in southeastern Newfoundland and northeastern New Brunswick.[2] Like so many things thus glimpsed from a train, the plant of course was not *Montia* at all, but a mass of half-emersed *Ranunculus Purshii* flecked with stranded fragments of *Lemna minor*. The latter plant, although widely dispersed in southern regions and abundant in pools and streams of eastern New Brunswick, Prince Edward Island, the Magdalen Islands and northern and eastern Nova Scotia, seems to be absent from western Nova Scotia as are the *Ranunculus* and *Lemna trisulca* with which it grew. The spring-pools below Amherst had other good aquatics which we had not seen in the western counties: *Myriophyllum verticillatum*, var. *pectinatum*, *Sagittaria cuneata* Sheldon (*S. arifolia* Nutt.) and, at their margins, swales of *Calamagrostis neglecta* or solid and almost impenetrable stands of the big bullrushes, *Scirpus validus* and *S. acutus*, forma *congestus*,[3] the latter a striking extreme growing apart from typical *S. acutus* and having the spikelets in a single very dense glomerule. The railroad embankment was beautiful with masses of the Harebell, *Campanula rotundifolia*, which we had not seen near Yarmouth, and with it a color-form of Butter-and-eggs, *Linaria vulgaris*, only in this form the corolla, except for the deep-yellow palate, was milk-white.

The sphagnous spruce-bog nearby is a gem, a spring-fed bog with central pond, its quaking margin full of *Carex limosa* and *C. diandra*, species common enough in the region bordering the Gulf of St. Lawrence but not found all summer in southwestern Nova Scotia. The bog was white with *Scirpus hudsonianus* and that rare and elegant cotton grass, *Eriophorum Chamissonis*, forma *albidum*.[4] The con-

[1] See Fernald & Wiegand, Rhodora, xii. 138 t. 84, fig. b (1910).

[2] Blake, Rhodora, xx. 104 (1918).

[3] Scirpus acutus Muhl. forma **congestus** (Farwell), n. comb. *S. occidentalis*, var. *congestus* Farwell, Mich. Acad. Sci. Ann. Rep. xix. 247 (1917).

[4] Eriophorum Chamissonis C. A. Meyer, forma **albidum** (F. Nylander), n. comb. *E. russeolum*, var. *albidum*, F. Nylander, Acta Soc. Sc. Fenn. iii. (1852) and in Anders. Bot. Not. (1857) 58. *E. russeolum*, var. *candidum* Norman, Ind. Supp. 46 (1864); Hartm. Handb. ed. 11, 450 (1879). *E. Chamissonis*, var. *albidum* Fernald, Rhodora, vii. 84 (1905).

ventional *Arethusa bulbosa*, *Calopogon pulchellus*[1] and *Pogonia ophioglossoides* were abundant; open turfless spots were brilliant with carpets of the deliciously fragrant (pungent) *Utricularia cornuta;* and the drier knolls had *Gaylussacia dumosa*, var. *Bigeloviana;* altogether a bog with most of the plants a bog ought to have and some which are not always found.

"The Chief" or "the Old Man" had assigned the pine barrens about Springhill Junction to Long and Pease because that area is conspicuous for its hopelessly barren aspect and it was certain that if any plant of real interest were isolated there it would be detected by that unequalled pair. But when, returning to Truro for the night, they joined me in the dining-car, they reported that the region was the most sterile area imaginable, not only on account of the limited number of species on the Carboniferous sandstone but because practically all of them had given up trying to produce either flowers or fruit. Besides the two pines they had a few really good things which we had not seen in other silicious areas: *Oryzopsis canadensis* (Poir.) Torr. (*Stipa canadensis* Poir.), known from New Brunswick and Prince Edward Island but not met by us elsewhere in Nova Scotia, and *Carex aenea* and *C. albolutescens*, var. *cumulata* Bailey, afterward found on various sandy barrens. They had found one brook-bottom which had some fertility, yielding the only *Petasites palmata* of the summer; and, while waiting for the train, they had weeded the freight yard and taken away *Linaria minor*, reported in 1907 by C. B. Robinson[2] from Pictou Landing, and now, as it soon proved, a common weed all along the railroad to Halifax and eastward to Cape Breton; the beautiful yellow-flowered *Lathyrus pratensis;* and a strange Crucifer which proves to be *Erysimum parviflorum*, a western species now beginning to move eastward along the railroads[3].

[1] *Calopogon pulchellus* is sometimes called *Limodorum tuberosum* L., Sp. Pl. 950 (1753), but that species rests chiefly upon and draws its specific name directly from "*Helleborine Americana; radice tuberosa*" of Martyn, Hist. Pl. Rar. 50, t. 50 (1728). The Martyn reference is the only one of the Linnean citations showing a plate, a beautiful full-page colored drawing of the plant of the Bahamas treated by Britton & Millspaugh (Bahama Fl. 96) as *Bletia purpurea* (Lam.) DC., although they cite Jacquin's *Limodorum altum*, the description of which definitely cited as a synonym Martyn's *Helleborine Americana; radice tuberosa*. *Limodorum tuberosum* L. is, of course, the earliest name for *Bletia purpurea*.

[2] C. B. Robinson, Bull. Pictou Acad. Sci. Assoc. i. 42 (1907), as *Chaenorrhinum minus* (L.) Lange.

[3] See J. C. Parlin, Rhodora, x. 146 (1908).

The party exploring about Truro had started out as a quartet, following the shores of Salmon River and getting, in some of the pools, *Ranunculus Purshii* and *Myriophyllum alterniflorum*, the latter species seen by us nowhere else during the summer; but they soon divided into pairs, Bean and White working down stream to the extensive reclaimed marshes where they secured a representative collection, but too largely weeds of civilization to require special mention. Bissell and Linder soon found rich, hillside woodlands and thickets and throughout the summer, whenever we were having particularly meagre botanizing, they longingly referred to this hillside at Truro. There they added to our list *Equisetum scirpoides*, *Carex aurea*, *Ranunculus abortivus* and other plants of rich soil not found by us in the silicious country; and for the first time in the summer, though we afterward got it in rich woods or in limy talus at other stations, a very neat little Poa which I had long known as a unique species characteristic of Newfoundland and Prince Edward Island. In its stoloniferous habit the plant resembles *P. pratensis*, but in the very short and stiffly spreading branches of the panicle, its large lance-ovate, acuminate spikelets 5.5–7 mm. long, with very thin and lustrous, strongly 3–5-nerved lemmas, which are conspicuously white-margined, the plant seems to stand well apart. In its technical characters it apparently matches the plate in *Flora Danica* (t. 2402) of *Poa costata* Schumacher,[1] a little known and somewhat problematic plant described from the island of Seiland in the Baltic. In our northeastern coastwise region, Newfoundland, Prince Edward Island and Nova Scotia (fig. 5), the plant is clearly indigenous and its identity with a plant otherwise known only from the Baltic recalls

[1] Poa costata Schumach., Enum. Pl. Saell. i. 28 (1801); Liebm. Fl. Dan. fasc. xli. t. 2402 (1845). *P. pratensis*, var. *depauperata* Liebm., l. c. as syn. (1845). *P. pratensis*, subsp. *costata* (Schumach.) Lange, Nomencl. Fl. Dan. 91, 203 (1887). *P. pratensis*, var. *costata* (Schumach.) Lange, l. c. 329 (1887). *P. angustifolia* var. *costata* (Schumach.) Richter, Pl. Eur. 87 (1890).—The following American specimens are referred here. Newfoundland: open woods, St. John's, August 4, 1894, *Robinson & Schrenk*, no. 219, in part, distributed as *P. pratensis* and subsequently given an unpublished herbarium-name by Scribner; gravelly fir and spruce woods, Clarenville, August 19 and 20, 1911, *Fernald & Wiegand*, no. 4,630. Prince Edward Island: sphagnous clearings and thickets, Bloomfield, August 7, 1912, *Fernald, Long & St. John*, no. 6,897. Nova Scotia: sphagnous pockets in moist, rich woods and thickets, Truro, July 18, 1920, *Bissell & Linder*, no. 19,995; glades by brookside in mixed woods, southern slope of North Mountain, north of Middleton, July 21, 1920, *Long*, no. 19,996; open woods at base of gypsum cliffs, Port Bevis, August 27, 1920, *Fernald & Long*, no. 19,999.

Polygonum acadiense Fernald, originally described from Nova Scotia but subsequently found to be a characteristic species of the Baltic.[1]

It was close work, after reaching Truro at 9 P. M., to get our collections into papers and be up and ready for a train leaving soon after 6; but we had some good areas noted which required the use of local, early-morning trains. Near Folleigh Lake the Intercolonial (now Canadian National) crosses a high gap in the Cobequid Hills where the traveller is invariably roused to enthusiasm as he looks down the steep slope to the beautiful Wentworth Valley and for several miles notes the unspoiled grandeur of the rich, hardwood forest, one of the few stands of virgin hardwood in the Maritime Provinces. It seemed worth while to get a good sample of the flora of a hardwood mountain-slope, so "the boys," Bean, White and Linder, were detailed to spend the day there. Pease and Long, having spent the preceding day in a hopeless barren, had earned the novel assignment for the day, the calcareous valley of 5-Mile River with its great, fantastic white cliffs of gypsum. To be sure, they had to get up by 5 o'clock and their return train would not get them back until after dark and long after supper-time. But what of that!

Bissell and I were quite happy to try our luck on the shores of Shubenacadie Grand Lake, for somewhere on those 20 miles of shore Mrs. Britton had found growing "among the rhizomes of *Osmunda regalis*,"[2] *Schizaea* and we vaguely hoped that the short time allowed us by the rather unaccommodating train-schedule would suffice to give us a glimpse of the plant *in situ*. As we walked down to the shore from Grand Lake station we found a common New England bullrush, which we had not seen in Nova Scotia, *Scirpus atrovirens*, var. *georgianus*[3] and thickets of Hobble-bush, *Viburnum alnifolium*, and other typical shrubs of the Canadian forest. The shore was composed of slaty and silicious ledges and cobble, where *Xyris caroliniana*, *Rynchospora capitellata* (Michx.) Vahl (*R. glomerata* of the Northern States),[4] *Sisyrinchium gramineum*, and other coastal

[1] See Fernald, Botanisk Tiddskrift, xxxiv. 253 (1916); Ostenfeld, *ibid*, 254; Fernald, Am. Journ. Bot. v. 229 (1918).

[2] Gray, Bot. Gaz. v. 4 (1880).

[3] SCIRPUS ATROVIRENS Muhl., var. **georgianus** (Harper), n. comb. *S. Georgianus* Harper, Bull. Torr. Bot. Cl. xxvii. 331, t. 22 (1900).

Since this was first noted (RHODORA, viii. 163) in 1906 as a common plant of the Northeast, repeated attempts to keep it apart from *S. atrovirens* have shown that it is hardly a species, but rather a fairly pronounced variety.

[4] See Blake, RHODORA, xx. 28 (1918).

plain plants abounded; and after following these ledges for half an hour, each of us with *Schizaea* of the wet bogs in his mind's eye but both stolidly refraining from complaint of the unpromising habitat, dry ledges with their thickets of Low Blueberry, *Vaccinium pennsylvanicum*, Black Huckleberry, *Gaylussacia baccata*, and the Nova Scotian representative of *Amelanchier stolonifera*, with an occasional damp pocket full of *Carex polygama* or *Rhus Toxicodendron*, Bissell finally broke the monotony by firmly asserting that it was foolish to expect *Schizaea pusilla* on dry ledges and that we might as well give it up or hunt for a boggy shore. The latter course seemed preferable, so, remembering a wet shore we had seen from the train, we retraced our steps toward it. Still hoping against hope I was watching every crevice when my eye detected a puzzling Violet. Dropping upon my knees, I carefully inserted my hand-pick into the rock-crevice and dug out the first Violet, and with it *Schizaea*. *Schizaea pusilla* of the bogs here growing in dry rock-crevices! We did not hunt up the boggy shore but picked and chiseled *Schizaea* from the ledges until a violent shower drove us to shelter.

In the shelter of the station we sorted our collections and found that the plant of the gravelly lake-margin, with quill-like leaves closely suggesting those of the Cape Cod *Sagittaria teres*, was really young material of the aquatic plantain, *Littorella americana* Fernald,[1] an extremely rare plant which Mrs. Britton had collected[2] on the shore of Grand Lake in 1879. The milkweed of the wet gravel suggested *Asclepias incarnata*, var. *pulchra*, but it had few, very short leaves (the longest 4.5–6.5 cm. long) glabrous or only minutely and very remotely hirtellous beneath. I had at times imagined that there might be a specific line between *A. incarnata*, with its elongate, essentially glabrous leaves and deeper-colored flowers, and *A. pulchra* Ehrh., with its oblong or elliptic leaves decidedly hairy beneath and its commonly paler flowers; but this Grand Lake material and a similar colony afterward found on Tusket Lake has the leaves even shorter and broader (in proportion) than in *A. pulchra* but as smooth as in *A. incarnata*.

We got back to Truro long before supper and had our collections in papers when the party returned from Folleigh. We had correctly

[1] Rhodora, xx. 62 (1918).

[2] E. G. Knight as reported in Bull. Torr. Bot. Cl. vii. 1 (1880); Gray, Bot. Gaz. v. 4 (1880); E. G. Britton, Linnaean Fern Bull. iv. 17 (1896); all as *L. lacustris*.

interpreted the region, to the extent at least of diagnosing it "rich woods:" *Polystichum Braunii*, *Carex scabrata* (fig. 9), *Habenaria macrophylla* and *H. bracteata*, *Arisaema triphyllum*, var. *Stewardsonii* (Britton) G. T. Stevens,[1] the Canadian representative of the more southern or Alleghenian *A. triphyllum*, *Ranunculus recurvatus*, *Amelanchier Bartramiana* (Tausch) Roemer,[2] *Viburnum alnifolium*, etc.

When, toward 9 o'clock, the 5-Mile River party came in, they were a tired, hungry and rain-soaked pair. They had been out since early morning in the richest spot of the summer and their sneakers and clothes plainly showed the result of a day of enthusiastic exploration of the knife-sharp pinnacles and unyielding talus and crests of gypsum. They had repeatedly emptied their collecting boxes and were loaded down with two rücksacks, a large bundle and two boxes full of specimens and had been forced to quit on account of darkness,—385 specimens of 154 species from a limy district, but not at all the plants of the acid coastal plain such as Bissell and I had got at Grand Lake or which abound in Yarmouth County: *Cystopteris bulbifera* (fig. 6), *Carex eburnea*, *Sphenopholis pallens*, *Amelanchier canadensis*[3] (fig. 8), *Fragaria vesca*, var. *americana* and *Erigeron hyssopifolius* (fig. 7) from the cliffs and talus; *Pteretis nodulosa* (Michx.) Nieuwl.,[4] *Athyrium acrostichoides* (Michx.) Milde,[4] *Milium effusum*, *Festuca nutans*, *Asperella hystrix* (L.) Humb.,[5] *Carex rosea*, *C. retrosa* and *C. Deweyana*, *Lilium canadense* (fig. 10),

[1] *A. triphyllum*, var. *Stewardsonii* is often very distinct and in its extreme development seems like a good species, but too often transitional forms occur and the plant seems to be best treated as a geographic variety. Bicknell has treated it as "a state or form" of *A. pusillum* (Peck) Nash (Bicknell, Bull. Torr. Bot Cl. xxxvi. 1) and states that "the evidence appears unmistakable that the two plants are extreme variations of a single species." *A. triphyllum*, var. *pusillum* Peck is a coastal plain extreme extending from Texas to Oklahoma and Florida, thence north to southeastern Massachusetts. Var. *Stewardsonii*, in its best development, occurs from Prince Edward Island to Vermont and Pennsylvania and perhaps to the mountains of Georgia. At least, the material in the Gray Herbarium referred by Dr. Gray to *A. quinata* (Nutt.) Schott (*Arum quinatum* Nutt.), a reputed species described from Georgia as distinguished from *A. triphyllum* by its "Leaves quinate, lanceolate, acuminate," shows leaves bright green below as in var. *Stewardsonii* and varying on the same plant from ternate to quinate, and the slope of the recurved flange at base of the hood exactly as in the northern var. *Stewardsonii*. In var. *Stewardsonii* of New England the leaves, although normally ternate (as are the majority of leaves of "*A. quinata*"), are sometimes quinate or with the lateral leaflets deeply parted.

[2] See Wiegand, RHODORA, xiv. 158 (1912).

[3] As interpreted by Wiegand, RHODORA, xiv. 150 (1912).

[4] See Weatherby, RHODORA, xxi. 178 (1919).

[5] See Hubbard, RHODORA, xiv. 187 (1912).

Listera convallarioides, Ostrya virginiana, Laportea canadensis, Dentaria diphylla, Geum canadense, virginianum and *strictum, Circaea latifolia* Hill,[1] *C. canadensis* Hill,[2] *Sanicula gregaria,* and *Viburnum Opulus,* var. *americanum* from the alluvial or other rich woods; and *Sagittaria cuneata* Sheldon (*S. arifolia* Nutt.), *Carex riparia,* var. *lacustris* (Willd.) Kükenthal and *Nymphozanthus rubrodiscus* (Mowry) Fernald,[3] from the pools.

Only the impossibility of properly preserving such a bulk of choice specimens without driers and presses and the insistent demands of our schedule could drag us at once away from a region so full of interesting spots, and this in spite of the hotel at which we were lodging. We were told that if we went to one of the hotels we should wish we had gone to the other, so we went to the other. Afterward, while visiting friends at Baddeck, we were told of one of their recently departed guests who had wired back, much to the bewilderment of the Gaelic telegraph-operator: "Spent a week this morning in Truro!" They could not tell us where he breakfasted.

Starting, by express, to Yarmouth our many bundles of specimens, already laid out in white paper but without driers, we ourselves went on the morning of July 20 to Middleton in the Annapolis Valley, a fascinating trip with its diversity of landscape: the great reclaimed marshes west of Truro; the ragged, white gypsum cliffs in the woods which Pease and Long pointed out to us, and others near Windsor; the great red-mud canons, deep down in the bottoms of which meandered at low tide tiny streams soon to be changed by the Fundy tides to broad and deep brick-red rivers; the great hayfields with the monument to Evangeline at Grand Pré and beyond them Blomidon capped with cloud; the miles and miles of apple and peach orchard closely cultivated and putting to shame our neglected New England orchards of rock-pastures and otherwise useless spots. Near Berwick and from there to Wilmot were vast uncultivated plains carpeted, wherever dry enough, with a close growth of the New Jersey pine barren *Corema Conradii,* and, although these barrens were the finest we saw, we had to content ourselves with small and unspoiled remnants of them at Middleton. Unspoiled, because, although these *Corema* heaths are forbidding enough in appearance and at the sur-

[1] See Fernald, Rhodora, xvii. 222 (1915).
[2] See Fernald, Rhodora, xix. 87 (1917).
[3] Rhodora, xxi. 187 (1919).

face are highly acid and barren, when deeply plowed and cultivated they are transformed into the great orchards for which "the Valley" is everywhere famed.

The *Corema* plains at Middleton, if a fair sample, as they doubtless are, indicate that the vast stretches of such country father east will yield interesting results. "All hands" browsed over these plains, during the afternoon, and although we became scattered, Long, Pease and I eventually found ourselves within hailing distance and our observations will suffice for the party. The drier places, where *Coremia* is dominant, had dewberries, mostly *Rubus arenicola* Blanchard, one of the characteristic trailers of Cape Cod and of York County, Maine, and the sand-barren *Viola fimbriatula*, *Lechea intermedia*, *Potentilla tridentata*, which abounds among the dunes at Provincetown and elsewhere near the tip of Cape Cod, and endless variations of *Vaccinium pennsylvanicum*, both the forms with yellow-green foliage and those with glaucous leaves, the series of variants called var. *nigrum*. A singular form of the glabrous variety of *Panicum depauperatum* was abundant, always with the inflorescences hidden at the base of the plant, and only when wandering into disturbed railroad-gravel or cultivated land assuming its ordinary appearance, with well-developed panicles on elongate culms. In the damper *Polytrichum*-carpeted areas *Sisyrinchium arenicola* (see p. 96) was found, and such places were characterized by *Carex atlantica*, *C. foenea*, var. *perplexa*, *C. albolutescens*, var. *cumulata*, and, more abundant than any, a sterile *Carex*, seeming to be a hybrid of the latter and the ubiquitous *C. scoparia*. *Bartonia virginica* was everywhere and the lustrous-leaved *Amelanchier stolonifera* abounded, though sadly denuded by some catapillar, and *Pyrola rotundifolia*, var. *arenaria* was there, though scarce.

In 1910, the late Dr. E. L. Greene, apparently making a change of trains at Middleton (a junction point), collected a purple Gerardia (now correctly known as *Agalinis*) and described it as *Gerardia neoscotica*. One of our reasons for stopping off at Middleton was to search for the type station for this northeastern representative of a southern genus and to secure good naterial. The search did not involve great difficulty for, in following a cartroad, Bissell and Linder promptly came upon Greene's original spot (clearly indicated in the original description) and collected material. By the time they got it back to the hotel most of the corollas were gone, so before break-

fast next morning Linder conducted me to the spot where we laid a good supply of freshly flowering specimens into folds of paper and he secured a good portrait of the growing plant. Subsequently, to be sure, the species proved to be ubiquitous in western Nova Scotia so that we got it in all stages of development, even to the large bushy-branched plants 3.5 dm. high with mature fruit, but it was gratifying to have a series from the type station. Dr. Harold St. John also collected the plant on Sable Island in 1913 so that it will doubtless prove to be generally distributed in the silicious areas of the province. Our collections embrace 25 numbers and the characters originaly pointed out by Greene are amazingly constant: the broadish rather fleshy leaves (which do not quickly curl as do the linear-attentuate leaves of *Agalinis paupercula*); the very long and foliaceous scabrous-serrulate calyx-lobes and the almost tubular little corolla with only slightly spreading lobes. To Greene's statement of characters should be added the facts that the mature capsule is shorter than to barely equalling the calyx, and that the mature calyx-lobes tend to become divergent. The corollas have no yellow lines in the tube, but whether this character is diagonistic can be determined only by further observation of fresh material of *A. paupercula*. Altogether the plant seems to be a clearly marked species.[1]

On July 21 we had the first break in our party and one which we keenly felt, for every one who knows Stanley Pease, his quick wit and kindly humor, will appreciate the loss we felt when he took the first train to Digby, thence to return to "the States." He and I spent a short morning, until his train left, on the plains about Middleton, collecting better material of some of the specialties but adding little of importance to the discoveries of the day before. Bissell, Bean, White and Linder drove across the North Mountain to the shore of the Bay of Fundy at Margaretville, bringing back such well-known plants of this basaltic coast as *Iris setosa*, var. *canadensis*, *Primila farinosa*, var. *macropoda* and *Euphrasia purpurea*, var. *Randii*. Long spent an exasperatingly short hour testing the rich woods and swales on the southern slope of the basaltic North Mountain, just glimpse enough for him to yearn all summer for another and extended visit to the slope where he had collected *Equisetum scirpoides*, *Poa costata*,

[1] AGALINIS **neoscotica** (Greene), n. comb. *Gerardia neoscotica* Greene, Leaflets, ii. 106 (1910). *A. paupercula* (Gray) Britton, var. *neoscotica* (Greene) Pennell & St. John, Proc. Bost. Soc. Nat. Hist. xxxvi 93 (1921).

Carex scabrata, Juncus Dudleyi, Trillium erectum, Corallorhiza maculata, Dentaria diphylla, Geranium Robertianum and *Osmorhiza divaricata,* the latter a northern species new to the western counties but previously found by Nichols in Cape Breton and afterward collected also by Long and me about gypsum talus in Cape Breton.

We reached Yarmouth that evening and the next three days were occupied until late in the evenings with our presses. The 5000 driers proved wholly inadequate, for Yarmouth was wrapped in its conventional blanket of fog and sun-drying was out of the question. We had already been driven to various expedients to meet the penetrating dampness and now with great regularity, as soon as corrugated ventilators had been inserted, the presses were stacked high in a square about the kerosene stove or suspended over it from the rafters. The wet driers for immediate use had to be "toasted" while such as could be allowed a more prolonged aeration were tucked end-on into chinks in the rough boarding of the empty hay-loft. The act of thus fitting the rough ends of the driers into shallow chinks from which they drooped soon became a real art and with the aid of a ladder we were eventually able thus to decorate the rough sloping walls of the loft with nearly 2000 driers at one turn.

The 23rd was for us an unfortunate day, for Bissell felt that he must get home but he had had a taste of Nova Scotia botanizing and the leaven continued to work after he got back to Connecticut; for later in the summer he took another vacation and one morning appeared ready for work just as we were going down to breakfast.

On the afternoon of the 24th there was time for a short half-day's collecting so the amended party, Long, Bean, White, Linder and I went after the weeds of the docks, railroad yards and waste heaps of Yarmouth. We scattered in different directions and the more interesting weeds of the day included typical *Sisymbrium officinale,* apparently commoner in Nova Scotia than var. *leiocarpum, Coronopus didymus, Lepidium Draba, Iberis amara* L., and *Carduus acanthoides.*

Next day, July 25, we were ready for field work and since, on the earlier visit, we had had only a glimpse of either Beaver Lake or Cedar Lake, we went there; Long and Linder stopping off for the day at Beaver Lake; Bean, White and I going on to Cedar Lake. Many of the plants of July 11th were now in splendid condition, the cespitose and nearly beardless *Pogonia ophioglossoides* forming extensive colonies with well-formed fruit, and, abundantly intermixed with it

in the cobble-beach, *Ophioglossum vulgatum*, so closely similar that it required real care to separate the two; and even after the plants were in press we found roots of *Ophioglossum* tangled with those of the *Pogonia*. *Panicum spretum* had developed wonderfully and now formed a handsome and almost continuous belt at the upper border of the beach, and in the cobble-beach with the *Pogonia*, *Ophioglossum* and *Liparis Loeselii* there was the usual series of intergrades between typical *Botrychium dissectum* and the var. *obliquum*.

In the inundated peaty border of Beaver Lake, Long and Linder were getting *Utricularia minor* and, in fine flower, the common but rarely flowering *U. intermedia*, and near by a beautiful tall *Panicum*, in habit resembling *P. spretum* but with broad panicle and very ciliate sheaths and densely bearded nodes, one of the complex of plants which is treated by Hitchcock & Chase as many species: *P. Lindheimeri*, *P. huachucae*, *P. tennesseense*, *P. languidum*, etc., but this plant is nearer the type-material from Texas of *P. Lindheimeri* than to the others. In sending to a contributor to Rhodora a galley proof in which *Panicum* was mentioned the editor once made the penciled query opposite one expression: "Redundant?" The proof came back without change except for the added comment: "The spikelets of all the Panicums are redundant." Be that as it may, it is certain that many of the species of *Panicum* as recognized at present in America are highly redundant. The four above mentioned are clearly phases of one species but I am not yet certain that there are not still more of their variants similarly masquerading as species. At the margin of the lake they found the unique *Myriophyllum tenellum*, and when, returning from Cedar Lake, we stopped to take them in, Long was a half-mile away on the barrier beach below the mouth of Beaver River, whence he returned with *Carex silicea*, the characteristic whitish-brown sedge of our southern dunes.

Our botanizing had developed a pendulum-swing, first north then south, so on the 27th, as it was the turn to work south, we went to Belleville station, Long and Linder working eastward to explore some of the lakes in that direction, Bean, White and I going west around the shore of Eel Lake and on to Abram River. Eel Lake is decidedly brackish, where we examined it full of *Potamogeton pectinatus* and *Ruppia maritima*, var. *longipes* Hagström,[1] which is abund-

[1] See Rhodora, xvi. 125 (1914).

ant in maritime pools southward quite to tropical America. The rocky shore, too, had maritime plants: *Samolus floribundus* in wet crevices, *Teucrium canadense*, var. *littorale*, and *Juncus articulatus*, var. *obtusatus*. West of Eel Lake we came to an extensive, dry, *Polytrichum*-covered barren with meagre enough vegetation but with *Habenaria blephariglottis* and *Ilex glabra* abundant, even dominant in some areas, *Carex aenea*, which we had had only from Springhill Junction, and a good number of Panicums. The brackish marshes along Abram River contained extenisve sloughs full of *Scirpus Olneyi*, which, when we first got it at Sand Beach, had seemed a thrilling discovery; a small quagmire at the border of the barren was full of *Utricularia geminiscapa* Benj. (*U. clandestina*); and a wet cart-road was bordered by *Juncus acuminatus* and *J. marginatus* (one of the long discredited plants of Lindsay's *Catalogue*).

When we returned to Belleville station Long was closely studying the railroad-bed—to find more of the curious little weed with short, club-shaped scapes and tiny dandelion-like heads, *Arnoseris pusilla*. The plant, a wanderer from Europe, is well established at this point and is likely to spread, since no one bent on gathering a bouquet will disturb it. Long and Linder had got into dry barrens where *Corema* abounds but most of the lakes had hopelessly inaccessible shores, flooded high into the bushes and bordering swales where, floundering through the acres of *Sparganium americanum* or *Pontederia* one would take his life in his hands (or more likely consign it to the waters). They had succeeded, however, in finding enough accessible shore at Clearwater Lake and at another, called Minnigobake, to secure *Cyperus dentatus*, which we had not previously collected, *Ophioglossum vulgatum*, occurring in cobble-beach as at Cedar Lake, *Myriophyllum tenellum* and *Subularia aquatica* again and, of course, *Utricularia subulata*. The most striking discovery, however, was that of *Juncus subcaudatus* (Engelm.) Coville & Blake,[1] in the wet border of a spruce swamp. This plant, treated in the 7th edition of the Manual as a southern variety of *J. canadensis* (ranging north to Rhode Island, although Long and I have subsequently got it on Cape Cod), we found through the rest of the season to be a thoroughly characteristic denizen of boggy woods or openings in spruce swamps from Digby Neck south through Yarmouth County thence

[1] Coville & Blake, Proc. Biol. Soc. Wash. xxxi. 45 (1918).

east to Queens County; but, although clearly belonging with *J. subcaudatus*, the Nova Scotian plant differs in having a shorter perianth with broader and greener uncorrugated sepals and thus constitutes an endemic Nova Scotian variety.

There is a little sand- and cobble-bordered lake by the railroad about a mile south of Lake Annis. We had more than once specially noted it as a promising spot, consequently on July 29, Bean, White and Linder went there to try their luck. They soon learned that this is Jassy Lake and if we had not begun to be satiated with *Utricularia subulata*, *Subularia aquatica* and *Myriophyllum tenellum*, would rank as a good spot. They brought back *Solidago canadensis*, which sounds uninteresting, but singularly enough, during the whole summer we did not see this characteristic Canadian species in southern Yarmouth County nor in Shelburne and Queens Counties, its place in swampy thickets being there preempted by another plant not yet in flower but decidedly not *S. canadensis*. They also had a very delicate *Utricularia*, the material all sterile but in the capillary forking of its leaves and in its bladders closely matching *U. gibba*.

The glimpse of Trefry's Lake which Pease and I had got two weeks earlier had stayed vividly in my mind throughout that crowded and ever-changing fortnight and Long was not averse to visiting its shores, so, while the others were at Jassy Lake, he and I spent one of the happiest days of the summer, making an almost complete circuit of the lake. The vegetation had greatly changed in two weeks and, owing to frequent rains and prolonged fog, the narrow beach had become almost invisible. As we started in we came upon *Sieglingia decumbens* in the most *natural* spot of the summer, at the upper border of the beach next the thicket, but there was a cow-path nearby so that here as elsewhere the evidence of its native character was inconclusive.

The very distinct goldenrod of the subgenus *Euthamia*, which we had been watching at other lakes, was now in good condition in the shallow water, though the plants higher on the beach were not yet flowering; a beautiful little plant with tall, simple stems rarely branching at the summit and with very fleshy and firm, dark-green mostly 1-nerved, linear-oblong to linear-lanceolate, blunt or merely acute, erect leaves, and with the deep-yellow heads so densely crowded as to make the corymb appear like a handsome golden button commonly only 1 or 2 cm. in diameter, or in extreme plants like a few

crowded buttons. This plant was seen or collected throughout Yarmouth County and eastward in the silicious belt as far as Queens, everywhere dominant and thoroughly characteristic of these sandy and cobbly lake-margins. Close study, however, fails to reveal any specific characters in the heads by which the Nova Scotia plant can be constantly distinguished from the coastal plain *Solidago tenuifolia* and it is, consequently, here treated as a pronounced geographic variety of the southern *S. tenuifolia.*

We had been closely watching *Utricularia cornuta* for, when the plants were still young and before the corollas expanded, we had noticed that in some colonies the flowers were approximate at the summit of the stem as good *U. cornuta* is supposed to have them, while in other colonies or often in the same colony were plants with the flowers scattered along the upper part of the stem, a character which, with its smaller flowers, is supposed to distinguish *U. juncea* of South America, the West Indies and the southern coastal plain. *U. cornuta* was at last in prime condition and here, on the beach of Trefry s Lake, were many plants with flowers as small as in the smallest-flowered *U. juncea,* but closely approximate; while at neighb ring lakes we found colonies with flowers larger than we had ever before seen in *U. cornuta* but as remote as in *U. juncea. U. juncea* is said to have a less spreading margin to the lower lip but if this character proves no better than the others ascribed to it, it will be evident that, when in 1847 Benjamin[1] treated the two as one species, he was not far from the truth.

Slightly beyond the *Smilax* tangle where Pease and I had turned back there was a second mass of Cat Brier, only this was *S. rotundifolia,* var. *quadrangularis,* a coastal plain variety previously known northward to Nantucket and Cape Cod. The name *quadrangularis* is most unfortunate, since the finer branches and branchlets of typical *S. rotundifolia* are as often as not quadrangular, the distinctive feature of the variety being its ciliate leaf.[2] While Long was gathering specimens of the *Smilax,* I was absorbed in contemplation of the golden-rod growing at the border of the spruce swamp, still immature but surely *Solidago Elliottii,* a thoroughly distinctive species, originally from Carolina and Georgia, named for Stephen Elliott, the great botanist of South Carolina, and "rare and local" even in south-

[1] Benj. Linnaea, xx. 305 (1847).
[2] See Bicknell, Bull. Torr. Bot. Cl. xxxvi. 10 (1909).

ern New Jersey; and north of the Cape Cod region so extremely rare that its single station on the Neponset meadows, south of Boston, has long been a famous spot. I was also worried by a shrub with lustrous dark-green leaves which looked amazingly like some Azalea, but close examination showed that the Nova Scotian shrub was an extreme form of Rhodora, *Rhododendron canadense* (L.) Torr., forma *viridifolium* Fernald,[1] quite lacking the grayish bloom which usually characterizes the foliage and new twigs of that shrub. At the northern end of the lake is a deep sluggish creek of indefinite depth, blackness and breadth which could be crossed only by finding a rare leaning tree or log; and during the hunt for such a bridge we struggled through a dense tangle of *Rosa palustris* and *Smilax rotundifolia*, southern types now losing their novelty and later on found to be frequent species, the *Smilax* seen northward to the banks of Sissiboo River in Digby County and eastward to the banks of Sable River in eastern Shelburne County.

In this thicket grew the characteristic coastal plain variety of *Juncus effusus*, the plant with slender purple sheaths, pliant and conspicuously corrugated culms, as in vars. *conglomeratus* and *Pylaei*, but with perianths intermediate between those of the other two varieties. This plant is general on the coastal plain from South Carolina to southern Maine and in Nova Scotia. West of the creek for some distance the spruce and red maple swamp was so extremely palpitating at the border of the lake that we were forced some distance back through the everywhere dominant Inkberry and Chain Fern, the monotony occasionally relieved by *Calla palustris*, which seems to be rare in southwestern Nova Scotia. One of the coves at this side of the lake had, far out in deep water, a broad belt of some aquatic *Sparganium*, and we made frequent attempts along the quaking margin to find stranded fragments. Failing in this and coming to surer footing, we waded out as far as possible and with the aid of a small tree succeeded in dragging in a tangle from the *Sparganium*-belt, the northern *S. fluctuans*, ranging from Quebec to northern Connecticut and Minnesota, and with it a mixture of the coastal plain *Utricularia purpurea* and sterile fragments of the characteristic New Jersey pine barren *Potamogeton confervoides*, a species also common in eastern Newfoundland but not heretofore known from Nova Scotia.

[1] Fernald in Wilson & Rehder, Mon. Azal. 122 (1921).

The evening train into Yarmouth whistled a couple of hours before we had completed the circuit of Trefry's Lake, but so keen were our interest and enjoyment, that last trains were not to be considered, and when we finally got back to our starting point a seven-mile road-walk was between us and Yarmouth. There were a few remnants left from lunch and, after passing the village of Arcadia, we left the dusty road and enjoyed our simple arcadian meal while closely scrutinized by the cattle of a roadside pasture.

Next day, we were more than crowded in putting up our specimens and overhauling the presses and at night we lost Bean, who was obliged to return home.

The map indicated some small ponds not far west of Hectanooga station and, consequently, on July 31, Long and Linder tried to find them, but not even the oldest inhabitant, whose acquaintance they promptly made, knew of any such ponds and they were forced to content themselves with Hectanooga Lake and the very unsatisfying Little Doucette Lake. These lakes, although not up to our somewhat exacting standard, furnished a few good things: the largest *Isoetes* of the summer, with bulbous base 4.5 cm. in diameter, the coastal plain *Potamogeton Oakesianus* which we had not had, *Najas flexilis*, also the first of the season, and one of the representatives of the complex group passing as *Sagittaria graminea;* and in the woods, which they reported as rich and unspoiled, were *Agrimonia gryposepala*, the northern *Pyrola secunda*, var. *obtusata*, and other plants indicating essentially virgin forest.

White and I, at the same time, had drawn a more prolific area, Salmon or Greenville Lake, where the reconnoitering party of the 13th had found *Galium tinctorium*. We left the car at the southwest corner of the lake and made our way across a boggy pasture to the shore. At the point where we reached the lake a cold brook enters and in it grows a splendid clump of the tall, perennial smartweed described by Small as *Polygonum punctatum*, var. *robustor*, a handsome plant ranging northward from South America but heretofore unknown east of Massachusetts. Subsequently, however, we found it at other stations in Yarmouth County (fig. 13) always characteristic and here as from Massachusetts to South America constantly differing from *P. acre* (or *P. punctatum*) in its very stout stems; strong, perennial, woody rootstock with coarse basal offshoots; more approxi-

mate and more truncated ocreolae; long-exserted fruiting pedicels; larger, always trigonous, achenes with concave faces; and distinctly later flowering season. The plant seems to be a perfectly definite species which should be called *Polygonum robustius*.[1] The shore was inviting in both directions, up the west side of the lake or around the southern end, and as a decision had to be made we chose the southern end. *Polypodium vulgare*, here having no rocks to grow on, was climbing the tree-trunks, the creeping rootstocks ascending in the crevices of the bark to a height of 2 or 3 meters. *Rosa palustris* and *Smilax rotundifolia*, with the variety *quadrangularis*, soon proved to be common, as were *Apios tuberosa* and *Woodwardia virginica*, but here the Chain Fern was growing in the cobbly beach of the lake. One of the Joe Pye Weeds was also frequent at the upper border of the beach; not, however, the widely dispersed Canadian species, the plant treated by Wiegand[2] as *Eupatorium maculatum* L. and by Mackenzie[3] as *E. Bruneri* Gray, but, as we might have predicted, the coastal plain plant, heretofore known from South Carolina to southern New Hampshire, *E. verticillatum* of Wiegand's treatment or *E. purpureum* of Mackenzie's. All the *Sisyrinchium gramineum*, an abundant plant in the cobbly shore, had quite simple scapes, thus simulating *S. angustifolium*, but its paler bluish flowers and its fruits were clearly those of *S. gramineum*. The plant, however, which most interested us, was an abundant *Habenaria* of the cobbly beach. In aspect strongly suggesting the frequent *H. flava* of the northern states, this plant differed in its very attenuate and narrow leaves chiefly borne toward the base, so that the flowering stem was subscapose, and in its extremely slender and open raceme of small greenish flowers with very short bracts. Subsequently the plant was found at various stations in the Tusket Valley, differing strikingly from the plant which passes as *H. flava* in New England and thence west to Minnesota and Missouri, south in the uplands to the Carolina Mountains; the latter plant having the broader, more elliptic and less attenuate leaves running higher up the stem and the raceme more compact and usually with much longer bracts. Detailed

[1] POLYGONUM **robustius** (Small), n. comb. *P. punctatum robustior*[*us*] Small, Bull. Torr. Bot Cl. xxi. 477 (1894). *Persicaria robustior* (Small) Bicknell, Bull. Torr. Bot Cl. xxxvi. 455 (1909).

[2] Wiegand, RHODORA, xxii. 64 (1920).

[3] Mackenzie, RHODORA, xxii. 165 (1920).

study shows that the plant of Yarmouth County is true *H. flava* (*Orchis flava* L.),[1] a species which in its typical form occurs on the coastal plain from Texas to Florida and New Jersey, the more inland plant being *H. flava*, var. *virescens*.[2]

We were in the midst of an exceptionally prolonged Yarmouth fog, and it was not until August 4th that we had a sufficient quantity of "toasted" driers to carry the accumulated collections safely through press. On that day, however, all four of us made excursions into the edge of the barrens in the eastern section of Argyle; Long and Linder trying the area near Argyle Head, White and I going on to the extensive barren between Lower Argyle and Goose Lake.

After passing through ordinary spruce woods, White and I came upon the dryish sphagnous border of the barren, at this season dominated by Bakeapple, *Rubus Chamaemorus*, which had not fruited well, *Carex oligosperma*, *Gaylussacia dumosa*, var. *Bigeloviana*, *Empetrum nigrum*, *Ilex glabra*, and *Calamagrostis Pickeringii*, var. *debilis*, with *Habenaria blephariglottis* scattered everywhere. Toward the wet center of the boggy barren there is a series of shallow pools, where in spring a considerable stream must flow. The borders of these pools are marked by the most spectacular growth of Pitcher Plant, *Sarracenia purpurea*, we had ever seen, while the open mucky spots were brilliant with solid carpets of *Utricularia cornuta;* and the pools themselves were often filled with the coastal plain *Scirpus subterminalis* and *Potamogeton Oakesianus*. East of the central pools the barren becomes very dry, carpeted with *Cladonia rangiferina*, *Corema Conradii*, *Empetrum*, *Scirpus cespitosus*, var. *callosus* and other such plants of dry heaths; and it was while here collecting *Bartonia virginica* and that puzzling little *Melampyrum* of northern bogs, that we came upon *Schizaea pusilla*, this time growing in hollows of the *Cladonia* carpet.

Goose Lake itself proved very uninteresting, bushed close down to the bouldery shore, so that we started back toward the railroad by a new route and quickly found ourselves in an extensive quagmire, where the particularly interesting plant was *Xyris montana*,

[1] "The specimens in the Linnaean and Gronovian herbaria are comparable to the specimens with elongated racemes frequently found in the South and Southwest"—Ames, Orchid, iv. 45 (1910).

[2] *Habenaria flava* (L.) Spreng., var. **virescens** (Muhl.), n. comb. *Orchis virescens* Muhl. ex Willd., Sp. Pl., iv. 37 (1805). *O. flava*, var. *virescens* Green, Cat. Pl. N. Y. 60 (1814).

here in greatest profusion and forming in the wettest hollows an almost continuous carpet. In collecting sods of this northern representative of an austral genus we constantly found our hands filled with loose needle-like flowering and fruiting scapes, for in this species, it appeared, the scapes are unique in freely disarticulating at the very base, all our other species of *Xyris* firmly holding their fruiting scape through the winter. At the western border of the barren we noticed a particularly wet quagmire and, although we had only a few minutes to train-time, we were so strongly tempted to take a peep that we ventured into the slough,—*Schizaea* everywhere, here in the wettest of moss- and liverwort-carpets, two Bartonias, one of them suggesting the Newfoundland *B. iodandra*, the other obviously neither that nor *B. virginica* of the drier barren, and *Arethusa bulbosa* abundantly fruiting. Here was a case of the luck we all have experienced,—the discovery of a choice spot on the way home—but there was nothing to do but to make mental note of it as a place which needed further exploration.

A few miles to the north, about Argyle Head, Long and Linder had also been collecting Bartonias and *Xyris montana*, but their other specialties were different from ours: *Juncus subcaudatus*, *J. marginatus*, *Eleocharis rostellata*, *Polygonum robustius* and the tree-climbing *Polypodium* again; and some good things we had not previously had, *Woodwardia areolata* and *Rhexia virginica* on the bushy shore of Randel Lake, the *Woodwardia* not heretofore definitely known east of southern New Hampshire, *Hypericum dissimulatum*[1] described by Bicknell from York County, Maine, Nantucket, Martha's Vineyard, Long Island and southward, *Rynchospora capitellata*, var. *discutiens* (Clarke) Blake,[2] which Long and I had found the preceding year on Cape Cod but otherwise unknown except in North Carolina and as a member of the famous, isolated coastal plain flora of northern Indiana, the southern *Eleocharis Robbinsii*, and, in good fruit, *Potamogeton confervoides* and, to add a northern flavor, *Euphrasia canadensis* Townsend,[3] a characteristic species occurring from the Gulf of St. Lawrence to the foothills of the White Mountains.

On August 6, White followed the too prevalent fashion and returned home, leaving Long, Linder and me to carry on the work. On the

[1] Bicknell, Bull. Torr. Bot. Cl., xl. 610 (1913).
[2] Blake, Rhodora, xx. 28 (1918).
[3] See Fernald & Wiegand, Rhodora, xvii. 195 (1915).

trip to Halifax we had noted along the bay south of Barrington some very attractive white sand hills and, since the nearest approach to such a habitat we had yet explored was the barrier beaches, we started on the morning of August 7 for Barrington. The train, as usual, was crowded and I found myself sharing a seat with a most interesting companion, Mr. John Kelly, Superintendent of the Lighthouses of western Nova Scotia and the Bay of Fundy. Mr. Kelly greatly relieved my mind by assuring me that the period of fog, which was still at its height and which had already lasted without interruption for more than 300 hours, was in reality abnormally protracted, most summer fogs of western Nova Scotia lasting less than 100 hours without at least a few hours of sunshine. From Barrington we were driven to Villagedale where the best dunes are situated, great white dunes invading the forest and in the rolling fog marvelously spectacular and magnified. As usual, there were broad flats among the hills, but *Xyris montana* of the quagmires seemed strangely out of place in such a habitat. *Limosella subulata*, *Sagina nodosa* and *Polygonum Raii* Bab.[1] were there, as we had hoped, and so was the always interesting *Tillaea aquatica*. *Juncus bufonius*, luxuriating in the brackish sand, had amazingly large flowers (sepals up to 9 mm. long) but *Viola primulifolia*, wandering in from the acid areas, was fruiting though its leaves were less than 1 cm. in length. *Juncus Greenei*, the commonest species on Cape Cod, and formerly known eastward only to Mt. Desert Island, was abundant with *Carex silicea*.

Returning to Barrington on Monday, the 9th, we drove eastward to Clement Pond. Three weeks earlier this pond had been most attractive from the train, with a well exposed beach, but now, after weeks of wet weather the beach was deeply submerged and travel was difficult. At the southeast corner of the pond (just why this large body of fresh water should be called a *pond*, while thousands of others like it are *lakes* we were unable to make out) the shore is a quaking bog, with characteristic growth of *Woodwardia virginica* and *Decodon verticillatus*, var. *laevigatus*, T. & G.[2], the latter heretofore unknown east of the lower Penobscot. In the drier *Polytrichum*-covered border of this bog *Carex albolutescens*, var. *cumulata* and *C. bullata*, var. *Greenei* were abundant and, in many areas, *Corema Conradii*.

[1] See Fernald, RHODORA, XV. 72 (1913).
[2] See RHODORA, XIX. 154 (1917).

The bottom of the lake had a fine development of *Subularia aquatica* but the most amazing sight of the day was the acres and acres of the southern *Solidago Elliotii*, forming solid thickets nearly 2 m. high in the spruce and red maple (often *Acer rubrum*, var. *tridens*) swamp. It was, indeed, a strange experience and one we should hardly expect even in the southern coastal plain, to break our way through the tall stems of this southern goldenrod, much as we had sometimes done on Maine bottomlands through the overtopping masses of Ostrich Fern. When reporting the seeming absence (p. 143) of the characteristically Canadian goldenrod, *Solidago canadensis*, from much of southwestern Nova Scotia, reference was made to an immature plant which there takes its place. This, needless to say, is *S. Ellicttii*, which from mid-August through September colors the spruce swamps and boggy clearings. Occasionally, too, in the Barrington swamp there were clumps of *Solidago rugosa*, var. *sphagnophila*, described from southeastern Connecticut, but now known to be common in southeastern Massachusetts and south to New Jersey.

The next morning, most happily, brought Dr. and Mrs. Graves and with them the news that, although he had been unable to get passage on the boat with them, Bissell would be back next morning; and after getting the presses in order, we started out for a short afternoon walk, Long and Linder going to Sand Beach where they got *Polygonum allocarpum* Blake,[1] and found that the *Elymus virginicus* of the barrier beach was all var. *hirsutiglumis*. Dr. and Mrs. Graves and I followed the railroad southeast beyond Yarmouth, getting into such masses of *Habenaria psycodes* as we had never imagined, thousands of brilliant plumes almost crowding each other in the boggy swales. *Botrychium dissectum* and var. *obliquum* were very abundant and here, as elsewhere in Nova Scotia and the eastern states, show such a connecting series as clearly to indicate that they are mere forms of the same plant, and since the name *B. dissectum* Spreng. has priority of six years over *B. obliquum* Muhl. it is necessary to call the latter *B. dissectum*, forma *obliquum*.[2] *Sieglingia* abounded

[1] Rhodora, xix. 234 (1917).

[2] Botrychium dissectum Spreng., forma **obliquum** (Muhl.), n. comb. *B,. obliquum* Muhl. in Willd., Sp. Pl. v. 63 (1810.)

in the dryish swales and we strongly felt that it here *looked* indigenous; and the most abundant rush of these swales was a plant entirely sterile and afterward seen in similar profusion south to Argyle and north to Digby Neck. Everywhere the plant fails to set fruit and the best we can do with it is to suppose it a hybrid of *J. articulatus* and *J. brevicaudatus*, both of which abound in the region.

(*To be continued.*)

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HABENARIA CLAVELLATA WITH EMARGINATE SPUR.

RHODORA

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THE GRAY HERBARIUM EXPEDITION TO NOVA SCOTIA

1920.

M. L. Fernald.

(Continued from p. 152.)

Luckily Bissell's boat got in promptly, although so baffled by the dense fog (now rapidly approaching the 400-hour mark) that she had difficulty in making the landing. Bissell had barely time to change his clothes before it was time to start for Lower Argyle, for I was anxious to get back to the quagmire White and I had been forced to leave only partly explored, and the others were ready to visit this particularly accessible station for *Schizaea*. The quagmire kept us busy most of the forenoon, chiefly with the collection and study of the amazingly abundant and perplexing representatives of the coastal plain genus *Bartonia*. The genus was now at the height of flowering and for the next two weeks we diligently and unintelligently collected these plants wherever we went. As currently recognized, *Bartonia* consists of four species: the strictly southern *B. verna*, apparently unique and ranging from Louisiana to southern Virginia; *B. virginica*, which seems to be a well-behaved and constant plant, ranging northeastward to the drier barrens of Nova Scotia; *B. paniculata*, extending from Louisiana and Florida to York County, Maine; and the endemic Newfoundland *B. iodandra*. Our constant embarrassment was regarding the two latter. The typical southern *B. paniculata* is a yellowish-green plant with the flowers in compound, thyrsoid inflorescences; with firm and subulate, yellowish leaves and calyx-lobes, the calyx cleft to the base; the corolla-lobes translucent to creamy-white and the anthers yellow. In the New-

foundland *B. iodandra*, on the other hand, the plant is purple-tinged and bears a simple or subsimple raceme with elongate pedicels; the blunt leaves are oblong or ovate and fleshy; the calyx is cleft only two-thirds or three-fourths to the base into herbaceous, oblong or ovate lobes; the corolla is decidedly petaloid and its white or purplish lobes much longer than in *B. paniculata*, and the anthers are usually purple. Unfortunately, however, wherever in Nova Scotia we found the typical southern *B. paniculata*, it was usually, if not always, associated with a coarser plant with simpler inflorescences, purplish color, larger corolla and purple anthers, in these characters closely approaching *B. iodandra* of Newfoundland. In Nova Scotia the two plants so freely intergrade that it is most difficult to draw a sharp line between them. The trouble is not a new one. In 1894 the late Dr. Geo. G. Kennedy and Mr. Emile F. Williams found an intermediate plant in a sphagnous swamp in Norfolk County, Massachusetts, and in 1900 Williams published[1] an account of it and an illustration as *B. iodandra;* and Bicknell, finding the same intermediate plant on Nantucket, took it in 1915 to be unquestionably *B. iodandra*, but stated that "It is found also on Martha's Vineyard and apparently, also, on Long Island, not always, however, perfectly maintaining the characters of its typical form, and certain rather dubious examples undoubtedly raise the question whether it may not be intergradient with *Bartonia paniculata.*"[2] Subsequently, partly in response to an argument for which I am responsible, Bicknell has dropped[3] *B. iodandra* from his Nantucket list; but our extensive collections from Nova Scotia and a prolonged but unsuccessful endeavor to find true specific characters for *B. iodandra* convince me that both he and Williams originally hit very near the truth. On its constantly less deeply cleft calyx and its larger corolla *B. iodandra* can be maintained as a Newfoundland variety of *B. paniculata*, while the intermediate plant of Nova Scotia at least is best treated as a transitional variety.

But, to return to the barren at Lower Argyle. The slightly elevated, bushy knolls in the barren were often covered by a dwarfed and contorted form of the coastal plain *Thelypteris simulata*, already

[1] Williams, Rhodora, ii. 55, t. 15, fig. 5 (1900).
[2] Bicknell, Bull. Torr. Bot. Cl. xlii. 33 (1915).
[3] Bicknell, Bull. Torr. Bot. Cl. xlvi. 423 (1919).

found by us, but now, as it was maturing, becoming more obvious than heretofore. *Drosera longifolia* and *D. rotundifolia* were, of course, abundant but a plant which exactly combines their characteristics and which is unquestionably a hybrid between them was found on only one knoll.

Suddenly Long remarked: "If we were in southern Jersey we should call this *Agrostis elata*." And surely that is what it proves to be but, instead of being confined to the Argyle barren *A. elata* Pursh, heretofore recorded from east of Long Island only on Nantucket,[1] was found on all the boggy barrens from Digby and Yarmouth Counties to Queens. Dr. St. John got it on Sable Island; he, Long and I collected it in 1912 on the Magdalen Islands and it is common in Newfoundland. Many of the specimens are absolutely inseparable from material from Pursh's type region (New Jersey), but others have conspicuously awned spikelets. These vary in length from 3.3–4 mm. and in this outlying Canadian and Newfoundland area the plant passes clearly into *A. hyemalis* and its var. *geminata* (Trin.) Hitchc. *A. elata* seems, therefore, to be a coastal plain extreme of *A. hyemalis* with very long spikelets, rather than a variant of *A. perennans* with which Hitchcock unites it.

Late in the afternoon, having made a good cross-section of the barren, we turned toward the sea-shore and, in following a path through an alder thicket, found a carpet of the European *Potentilla procumbens*, here, as when we afterward saw it at Baddeck, too near a cow-path for us to consider it indigenous. On the sea-beach *Rumex pallidus* was in prime condition and *Suaeda americana* was maturing. We had scarcely begun observing the beach plants when a downpour of rain warned us to hurry toward the village and the station, but, in scrambling through the bushes above the beach, we came upon such a handsome and now fully ripe colony of *Carex panicea* that we temporarily ignored the rain to dig some good specimens.

The southern shore of Salmon Lake had yielded so many good things that we were all anxious to see more of the sandy and peaty beach, and especially to extend our exploration up the wholly unsettled west side of the lake. So, on August 13, we landed at the brook where *Polygonum robustius* luxuriates. The boggy swale nearby had

[1]Bicknell, Bull. Torr. Bot. Cl. xxxv. 192 (1908).

Juncus subcaudatus and a peculiarly brittle and fastigiate-branched extreme of *Bartonia paniculata*, a variety heretofore known only from Sable Island. *Thelypteris simulata* was abundant in spruce and alder thickets and the handsome *Aster nemoralis*, var. *major* Peck[1] was beginning to bloom. The *Lycopus uniflorus* of these thickets had an unfamiliar appearance and upon returning to Cambridge I find it to be var. *ovatus* Fernald & St. John[2], recently described from Sable Island and Canso.

The blackish-fruited Chokeberry, *Pyrus arbutifolia*, var. *atro-purpurea*, is everywhere abundant in western Nova Scotia and had for some time shown its characteristic color, but here many of the smaller-leaved shrubs had the small berries just reddening and were obviously typical *P. arbutifolia*, not positively known nearer than Cape Cod and Plymouth County, Massachusetts. The inundated sandy margin of the lake was carpeted with unusually fine *Subularia aquatica* and a stranger happening along would have been amazed to see five men standing in water above their knees, bent over and intently watching the bottom and every few seconds making a plunge to the shoulder with the right arm. After lunch Bissell and Dr. and Mrs. Graves started toward Tusket to catch the train; but Long, Linder and I, having determined to make a circuit of the lake, kept on to the north. Everywhere the thicket was bordered by *Rubus tardatus* of Cape Cod and of York County, Maine, one of the most characteristic blackberries of these lake margins; and the ledgy shores had colonies of the *Panicum* so characteristic of the coastal region of southern New England, which has been referred to *P. virgatum*, var. *cubense*.

Approaching sunset warned us before we had got half the length of the west shore that our plan to encircle the lake was too ambitious. The fog was still with us and during the eight-mile road-walk into Yarmouth we amused ourselves vainly attempting to make out the outlines of more than two of the roadside telephone poles at a time, —an index to the extreme density of the atmosphere. It was some days after this, when the uninterrupted fog was in its fourth week,

[1] Aster nemoralis Ait., var. major Peck, N. Y. State Mus. Ann. Rep. xlvii. 155—reprint, 29 (Jan., 1894). *A. nemoralis*, var. *Blakei* Porter, Bull. Torr. Bot. Cl. xxi. 311 (July 20, 1894).

[2] Proc. Bost. Soc. Nat. Hist. xxxvi. 92 (1921).

that Mrs. Graves wrote home that they had been there for a week but had not *seen* Yarmouth yet. Nevertheless, in spite of this heavy blanket of fog and the naturally late spring, green corn was maturing in Yarmouth gardens; such summer-flowering plants as *Xyris caroliniana, Habenaria blephariglottis* and *H. psycodes, Bartonia virginica* and *Gratiola aurea* were as early as in southern New Jersey; and such autumn-flowering plants of New Jersey as *Spiranthes cernua, Chelone glabra, Solidago puberula, S. sempervirens, S. rugosa, S. Elliottii, S. uniligulata* and *S. graminifolia, Gnaphalium obtusifolium, Cirsium muticum* and *Prenanthes trifoliolata,* in southern Nova Scotia begin flowering in midsummer, often a full month earlier[1] than in southern New Jersey. Another peculiarity of this region of Nova Scotia, one which we were tempted to attribute to the dense and protracted fogs, was the almost complete lack of mosquitoes. We had been most happily surprised to find that we could go anywhere on these boggy barrens without meeting this much-to-be-expected tenant. But in explanation some one suggested during the summer, that in such a dense atmosphere mosquitoes, if they there exist, must remain in the larval stage, wings being quite useless to them!

The Tusket party brought in a very extreme plant of the *Carex Goodenowii* affinity, only in this plant the perigynia have long, slender stipes. This proves to be *C. Goodenowii,* var. *strictiformis* (Bailey) Kükenth. an endemic American variation which, in its extreme development, is very definite. And, to my delight, they had typical *Ranunculus Flammula,* the handsome subaquatic plant of Europe which I had known in eastern Newfoundland, now for the first time collected on the mainland of eastern North America. At Tusket it

[1] Our earliest flowering specimens from Nova Scotia and the earliest date of flowering in southern New Jersey (copied from Stone's *Plants of Southern New Jersey*) are given below.

	Nova Scotia	Southern New Jersey
Spiranthes cernua	August 31	early September
Chelone glabra	August 4	late August
Solidago puberula	July 21	early September
Solidago sempervirens	August 10	early September
Solidago rugosa	August 10	late August
Solidago Elliottii	August 13	early September
Solidago uniligulata	July 20	early September
Solidago graminifolia	August 9	late August
Gnaphalium obtusifolium	August 7	late August
Cirsium muticum	July 13	mid-August
Prenanthes trifoliolata	August 10	late August

grows in its characteristic habitat, a cold spring-brook. And Mrs. Graves was absolutely positive that, just as they were boarding the train at Tusket, a woman, who drove up in an automobile, had in her hand a bunch of the so-called Plymouth Gentian, *Sabatia Kennedyana* Fernald,[1] the most beautiful wild flower of the Cape Cod region. We should, perhaps, have been content with our collections of the day and not have insisted on pressing Mrs. Graves with the illogical query: "Why in the world didn't you ask where she got it?" Obviously, it would have been useless, for the train had started. But that unexplained *Sabatia* haunted us and we could not drive it out of our minds.

Two days were necessary to get the presses in order before leaving, on August 16, to examine the coastal sands of Queens County, our headquarters for two days being at Port Mouton (everywhere in Nova Scotia pronounced "Port Mut-toon"). Promptly after dinner Graves, Long and Linder started for the dunes at Central Port Mouton, bringing back such novelties as *Juncus bufonius*, var. *halophilus*, *Euphorbia polygonifolia* and, from a bushy pasture, a greater variety of *Crataegus* than we had yet seen. They also had found again *Polygonum Raii* and *Sagina nodosa* which we had seen in the damp sands at Villagedale. Bissell and I were having better luck. We had gone to the mouth of Broad River where, until a violent storm of the preceding winter tore it away, a great range of dunes had long existed. We found the sand-plants the others were getting and in one strip of brackish sands a few plants of the rare *Rumex maritimus*, var. *fueginus* (Phil.) Dusen,[2] formerly known from Sable Island and the Magdalen Islands but not from the mainland of Nova Scotia. A beautiful little boggy pocket in the midst of hideously burned and charred spruce woods gave us some of the coastal plain specialties we had been getting in Yarmouth County: *Schizaea pusilla*, *Thelypteris simulata*, *Juncus subcaudatus*, *Ilex glabra* and the two Bartonias of sloughs.

Next morning we all went to the dunes at Central Port Mouton, hoping by further exploration to add some species we had expected to see in such a habitat, but the most interesting discovery was to find that the typical dune species, *Carex silicea*, was quite absent from the

[1] Rhodora, xviii. 150, t. 121 (1916).
[2] See St. John, Rhodora, xvii. 81 (1915).

dunes but growing in the crevices of a rocky headland along with *Smilacina stellata*, which we had also failed to see on the dunes. In a boggy thicket we were somewhat surprised to find the tangle of *Ledum groenlandicum* (subarctic) and *Ilex glabra* (Louisianian) stretching above our heads, and specimens of the *Ledum* which we collected show the trunks and main branches to be practically 2 m. (19.5 dm.) high.

In the afternoon Bissell and Graves went to the mouth of Broad River, returning with *Conioselinium chinense* from a patch of rich, old woods, and bringing in the largest *Bartonia virginica* of the season (3 dm. high).

Long, Linder and I spent the afternoon near Port Joli (pronounede Jolly) following a supersaturated corduroy-road back to Louis Lake, which had been described to us as shallow and "full of weeds." The border of the lake proved to be a quaking bog and, without a boat, we were forced to content ourselves with merely imagining all sorts of exciting things in the swimming mass of vegetation. The *Ilex verticillata* in the bog had densely pubescent leaves, var. *padifolia*, which we had not known east of Massachusetts, and the bog itself was the home of *Arethusa*, now abundantly fruiting and a welcome sight in view of its rapidly approaching extinction in the eastern states.

Next morning there was time for some short local tramps before the early afternoon train back to Yarmouth, but the only striking novelty was *Crataegus Jonesae*, one of the most definite of species, supposed to be confined to the Maine coast, brought in by Bissell and Graves from the shore east of Port Mouton.

The Graves's time was getting short and there were too many things to do, so it was necessary to crowd the program. We were planning another trip away from Yarmouth, to start early on the morning of the 21st, but we decided that on the 20th we could take a simple automobile trip into the interior, just to see what the country was like; and since we had previously failed to reach our destination, when we started for Carleton and Kemptville, that direction seemed the natural one to take. Our route lay up the Tusket valley and, after a few stops, we succeeded in getting above Tusket Falls, when some one thought he saw an interesting plant on a wooded slope above Tusket (or Vaughan) Lake. The shore of the lake was

obviously of no interest, being bushed close down to the water and with absolutely no beach exposed, but, tiring of waiting for the others to return, I pushed idly through the bushes to the water's edge and there, with flowers fully expanded under several inches of water, was the beautiful Plymouth Gentian, *Sabatia Kennedyana*, the Rhode Island and southeastern Massachusetts representative of *S. decandra* of southern Georgia and Florida (fig. 12). Mrs. Graves's observation was splendidly corroborated, and we could not pass such a spot even if Carleton and Kemptville again had to wait. With the *Sabatia*, deep under water, were the coastal plain *Coreopsis rosea*, its previous northeastern outposts in eastern Massachusetts; typical *Habenaria flava*, the *Asclepias incarnata* of Grand Lake and *Rynchospora capitellata*, var. *discutiens* again; and, best of all, a very evident relative of the southern *Panicum longifolium*, the latter species (fig. 16) known as far north as New England only in southern Connecticut and adjacent Rhode Island. Our consciences were becoming troubled by the full boxes (we had merely gone for a ride) of specimens to be cared for and thoughts of that early train next morning so, just as on the previous trip up this valley, we drove on only to Pleasant Valley, where we took a crossroad to Yarmouth. But, as we were turning, Bissell spied in the sand near Sloane Lake, a goldenrod of the *Euthamia* section, which we had not had, the typical thin-leaved, coastal plain *Solidago tenuifolia*, previously unknown east of York County, Maine, though abundantly represented in Nova Scotia by the endemic variety of pond-margins (p. 143).

In September, 1917, Mr. Chesley Allen collected,[1] on a savannah between Little River and East Ferry on Digby Neck, a single plant of *Lophiola*, a most characteristic plant previously unreported from north of the New Jersey pine barrens, and all summer we had been awaiting the right opportunity and settled weather in order to go for a few days to Digby Neck, not only to rediscover *Lophiola* if possible but because we took that plant to be an index to a probably interesting lot of isolated coastal plain species. Anyone who knows the montane character of Digby Neck, forming a slender continuation, in places less than a mile wide, of the North Mountain for about 40 miles between the Bay of Fundy and St. Mary's Bay,—anyone who knows this slender montane peninsula with the bleak

[1] See Nichols, Rhodora, xxi. 68 (1919).

Bay of Fundy washing its outer shores would think us crazy to go there for coastal plain plants. But we could not overlook the occurrence of *Lophiola* there. So, as the psychological moment had come, the weather clearing, with wind in the west, we went on the 21st by train to Weymouth, thence to cross by boat in the late afternoon (when the tide would be right for going down Sissiboo River) to Sandy Cove on the Neck.

Before time for the boat we collected extensively about Weymouth, sending our plants back to Yarmouth by Bissell who had elected to return and to care for the accumulated material during our absence, and before supper the rest of our party landed at Sandy Cove, a beautiful harbor shut in by basalt cliffs. As we landed we wondered where in such a place to look for plants of the sandy coastal plain, but upon leaving the wharf we saw by the damp roadside carpets of the Nova Scotian purple gerardia, *Agalinis neoscotica*, northern representative of a coastal plain genus.

East of Sandy Cove lies a large lake, Lake Midway or Centerville Lake, and south of that a small pond in the woods, and to the west, at the head of Little River, the map indicated a chain of small lakes. So, on the morning of August 22, the Graves's and Linder were driven east to Lake Midway and Long and I went west. Our driver, Mr. R. W. Sypher, who knows the Neck intimately, told us that the lake east of Tiddville had been drained in order to quarry the infusorial earth which had formed its bed, and, when we first caught sight of one of the small remaining pools beyond some hills, we hurried across to prospect, and there was *Lophiola*, tall and just coming into bloom, acres and acres as far as the eye could see. There was obviously no need to go as far as East Ferry, so we drove only to Tiddville and spent the day following the savannah eastward along the Little River, a stream which might often be crossed "in two jumps." Our list for the day is a long one so it must be here cut down to the specialties, most of the distinctive coastal plain plants of the Yarmouth County bogs: *Schizaea*, *Xyris caroliniana* and *X. montana*, *Calamagrostis Pickeringii*, *Carex exilis*, *Lycopodium inundatum*, var. *Bigelovii* and *Ilex glabra*; in the pools and small pond-holes *Utricularia purpurea* and *U. geminiscapa*, *Nymphaea odorata*, var. *rosea*,[1] and

[1] The flowers of *Nymphaea odorata*, var. *rosea* are by no means always pink, in fact they oftener have white inner petals. The plant is more familiarly known as

Eleocharis Robbinsii; and, rare in the mud, *E. olivacea;* a pretty good list of coastal plain types to find within half a mile of the cold rocks of the Bay of Fundy. *Lophiola* was abundant, coloring the savannahs for two or three miles with its misty, white corymbs, its yellow-bearded and reddish expanded perianths certainly suggesting the English name, Golden Crest.

The genus *Lophiola*, although placed by Bentham & Hooker in the *Haemadoraceae*, is by other systematists placed in the tribe *Conostylideae* of the *Amaryllidaceae*. This tribe has 50 species confined to southwestern Australia, 1 species at the Cape of Good Hope and the genus *Lophiola*, with three localized areas: one extending from Mississippi to Florida and southern South Carolina; another the pine barrens of New Jersey and adjacent Delaware; the third, the savannahs on Digby Neck (fig. 17). But the plant of Digby Neck has a further claim to interest. The genus was based on a plant said to have been carried back to England by John Lyon in 1812 and there cultivated and, in 1813, illustrated and described from a plant which flowered in England. Lyon, it would seem, from what little is recorded of him, had lived at Philadelphia until, in 1806, he returned to England "with 14 new spp."[1] He soon returned to America and devoted his energies to botanical exploration of North and South Carolina, Georgia and Florida, whence he returned to England in 1812; "he assiduously explored this region [the Carolinas] from Georgia as far north at least as the Grandfather Mountain, and died at Ashville . . . . . some time between 1814 and 1818."[2]

Now the case would not be specially complicated if *Lophiola aurea* were, as has been generally supposed, a monotype; but close study shows that the plants of the three different areas are quite distinct species, the plants of the South and of New Jersey having olivaceous capsules free from the perianth only above the middle and seeds

var. *minor* Sims, but the latter name was substituted by Sims for Pursh's earlier one because, when cultivated in England, the variety had white flowers. The bibliography is as follows:

Nymphaea odorata, var. rosea Pursh, Fl. Am. Sept. 369 (1814). *N. odorata*, var. *minor* Sims, Bot. Mag. t. 1652 (1814); Conard, Waterlil. 183, fig. 68 (1905). *N. minor* (Sims) DC., Veg. Syst. ii. 58 (1821). *N. odorata*, var. *parviflora* Raf., Med. Bot. ii. 45 (1830). *N. rosea* (Pursh) Raf., l. c. (1830). *Castalia odorata*, forma *rosea* (Pursh) Britton, Cat. Pl. N. J. 44 (1889). *C. odorata rosea* (Pursh) Britton acc. to Morong, Mem. Torr. Bot. Cl. v. 154 (1894).

[1] Britten & Boulger, Biogr. Ind. Brit. and Irish Bot. 109 (1893).

[2] Gray, Lond. Journ. Bot., l. 11 (1842).

blunt at both ends, the Nova Scotia plant, as shown by fruiting material co lected in October by Mr. Sypher, having the red capsules free two-thirds their length and bearing seeds which are commonly tailed at one end. The two southern plants flower in early summer, the Nova Scotian from mid-August to October. The great difficulty arises in interpreting the original description and plate, for the plate, in such characters as are shown, very closely matches Nova Scotian material but is not a good match for most specimens of either the New Jersey or the more southern species.

I have been generously loaned or have had access to all the material of *Lophiola* in the herbaria of the New York Botanical Garden, the Philadelphia Academy of Science, the National Museum and the Missouri Botanical Garden and in all the collections find but two sheets, both collected somewhere in Florida by Rugel, which compete with the plant of Digby Neck in resembling the original plate of *L. aurea*. These two sheets are of unusually large-flowered material of the southern species, and, when we bear in mind what we know of Lyon's movements between 1806 and 1812 and that the plate was made from cultivated material, it seems wiser to apply the name *L. aurea* to the southern plant than to force it upon the superficially somewhat similar plant of Nova Scotia. The Nova Scotia plant should, therefore, be treated as a new species, the New Jersey plant being *L. americana* (Pursh) Wood.

Graves and Linder found Midway Lake with a bouldery and uninteresting shore, though at one point they were able to get *Myriophyllum tenellum* and a beautiful lot of freshly flowering *Utricularia resupinata* (from Florida north), making our ninth species of the genus. They also got *Potamogeton Oakesianus* and *P. bupleuroides*, the latter species new to our collections, and on the Fundy shore, Graves got *Sedum roseum* and *Polygonum allocarpum*, both typical plants of this coast.

Before leaving Sandy Cove for Digby on the 23rd, Long and I stole out in the early morning to the little pond which lies almost in the village. We were told: "It never had a name, but some folks call it Lily Lake;"—so we will call it Lily Lake. In a deep muddy cove were two splendid plants, the northern *Myriophyllum Farwellii* (alpine ponds of Gaspé to northern New England, northern New York and northern Michigan) and, mingled with it, that hand-

some pondweed with purple-mottled stems, *Potamogeton pulcher*, heretofore unknown northeast of Nantucket and of York County, Maine (fig. 15).

After the Sandy Cove trip Dr. and Mrs. Graves felt that they must get back to Connecticut and we attempted to forget the loss of their good comradeship by ourselves travelling as far in the opposite direction—to Cape Breton; Bissell and Linder to North Sydney as a base, Long and I to Baddeck, to the hospitable home of Mr. and Mrs. Charles T. Carruth of Cambridge. The region including Baddeck and North Sydney had already been much botanized by John Macoun and by many amateurs, so that we anticipated no noteworthy discoveries; but we naturally wanted a glimpse of this region of Carboniferous sandstones, gypsum-cliffs and limestones, especially to compare it with the acid southwestern counties. And the comparison was truly a contrast. We saw absolutely none of the coastal plain specialties which all summer had occupied our concentrated attention. Around the gypsum outcrops at Port Bevis (near Baddeck) were many of the species which Long and Pease had got in similar habitats along 5-Mile River or which we had from Truro: *Cystopteris bulbifera*, *Carex eburnea*, *Sphenopholis pallens*, *Erigeron hyssopifolius*, etc. in the rock crevices; *Pteretis nodulosa*, *Poa costata*, *Carex retrorsa*, *Ranunculus recurvatus*, *Solidago latifolia* in the woods; *Ranunculus Purshii* in the pools; and a few we had not previously seen: *Shepherdia canadensis* in the talus, *Gnaphalium sylvaticum* in pastured woods and other half-natural but doubtfully native habitats, *Cornus Amomum* along a brook, and the boreal *Scirpus pauciflorus* in the border of a salt marsh near Baddeck where the southern *Distichlis spicata* abounds. In a cold brook with *Potamogeton alpinus*, was a vigorous growth of *P. vaginatus* Turcz.,[1] a boreal, circumpolar species not before known in Nova Scotia, and here, as on Prince Edward Island, in New Brunswick, and on the Labrador Peninsula without good fruit; and at the mouth of a brook entering Baddeck Bay the colony of *Thelypteris palustris* (*Aspidium Thelypteris*) was as deliciously fragrant as Vanilla Grass (*Hierochloe odorata*). This fragrant form of the Marsh Fern has been previously known from a collection made by Miss Sarah F. Sanborn in southern

[1] See St. John, Rhodora, xx. 191 (1918).

New Hampshire. It is *Thelypteris palustris*, forma *suaveolens*.[1] We had hoped to find new stations for the two local species, *Polygonum acadiense* (already referred to, p. 134) and *Agropyron acadiense* Hubbard,[2] which Dr. St. John and I had discovered in 1914 at Grand Narrows, but, in our searching of the beaches about Baddeck, Long and I found only a solitary plant of the *Polygonum*, on Kidstone's Island, here, as at Grand Narrows, associated with *P. Raii*, and at this station with *Agropyron pungens* clearly passing into *A. acadiense*.

Bissell and Linder, in the meantime, were having their best collecting in the rich woods about a lime quarry on a mountain near George River. They got many of the species we were finding and some others new to our summer's collections: gigantic *Thelypteris Filix-mas* (L.) Nieuwl., the only *Cystopteris fragilis* of the whole summer, *Athyrium acrostichoides*, *Carex Bebbii*, *C. aurea*, *Satureja vulgaris* and other plants of sweet or basic soils, though at the leached summit of the mountain they found a typical acid bog with *Rubus Chamaemorus* and the other common acid bog plants.

Dr. and Mrs. Webster having told me of a spot near Gavelton, on the Tusket, where they had found *Sabatia Kennedyana* without having to reach under water for it, as we had been forced to do, Dr. Webster most kindly took Long and me to the station on the morning of September 2nd, and there, near the foot of Gavelton (or Butler) Lake, he introduced us to a most fascinating savannah. Our time was very limited but enough to indicate what was to be the next day's work. Unfortunately Bissell could not share in this, one of the best days of the season, for he returned home on the night of the 2nd; but on the 4th Long, Linder and I went to Gavelton prepared for a full day of collecting.

Sabatia was abundant both on the wet savannah and the cobbly beaches and, of course, all the specialties we had previously found with it. *Proserpinaca palustris* and *P. pectinata* (Florida to southern Maine), the Atlantic American representatives of the tropical and austral tribe *Halorrhageae*, a tribe with most of its species in Australia, were abundant on the savannah and with them, clearly a hybrid of the two, as it likewise seems to be in eastern Massachusetts

[1] THELYPTERIS PALUSTRIS Schmidel, forma **suaveolens** (Clute), n. comb. *Nephrodium Thelypteris*, forma *suaveolens* Clute, Fern Bull. xviii. 87 (1910).

[2] RHODORA, xix. 15 (1917).

and Rhode Island, *P. intermedia* Mackenzie,[1] originally described from the pine barrens of New Jersey and from Georgia. *Polygonum Muhlenbergii*, first east of the Penobscot, *P. robustius* and *Glyceria pallida*, first east of southern Maine, abounded. The southern *Panicum dichotomiflorum* grew on shores or at the border of the savannah, and the tall clumps of *Juncus canadensis* had an unusual appearance owing to the very few (3–7) flowers in the scattered glomerules borne on long, almost erect branches, the inflorescence thus suggesting that of *J. brevicaudatus* but the plant clearly an extreme variation of *J. canadensis*, with the perianths unusually long for the species (3.5–4 mm. long). Typical *J. canadensis* has the flowers very numerous in the glomerule, the branches less rigidly erect and the perianth from 2.5 to very rarely as much as 3.5 mm. long. Linder and I later (in October) traced the extreme variety nearly to the headwaters of the East Branch of the Tusket, and although it sometimes intergrades with typical *J. canadensis* it seems worthy of recognition as a variety. Upon looking up the collections made by Long and me on Cape Cod in 1918 I find that at one of the ponds in Dennis we got this same peculiar variety of the Tusket valley.

On the beach of the lake *Woodwardia areolata* of southern, wet cypress swamps and *W. virginica* of coastal plain quaking bogs were growing among the cobble-stones, and the finest Bog Cranberry, *Vaccinium macrocarpon*, I had ever seen was here trailing over the quartzite boulders; while the dominant blueberry of the rocky shore was *Vaccinium vacillans*, heretofore unknown in New England east of southern York County, Maine, although there are records of it from Nova Scotia.

This was to have been our last day in the field, for the calls of home and the opening of the academic year could not be indefinitely postponed, but it did seem "hard luck," just as we were packing to leave Nova Scotia, that the isolated coastal plain types were so rapidly developing. By working overtime, however, and blessed at last by brilliant September sunshine, we got the presses into shape and took just one more day in the field. On September 6 we went over the only bad road we encountered in Yarmouth County, to Great Pubnico Lake, a splendid lake but with water, as everywhere else, uncomfortably high. On the sandy shore with the

[1] Mackenzie, Torreya, x. 250 (1910).

conventional but still very choice coastal plain species was *Rhexia virginica*, which we had had only from Randel Lake; but the great surprise was a boggy savannah at the border of the lake where, at least close to the lake, the two dominant sedges were the northern *Carex oligosperma* (Labrador to Great Bear Lake—at the Arctic Circle, south to northern Pennsylvania, Michigan and Minnesota) and *Eleocharis tuberculosa* (Texas to Florida and north to eastern Massachusetts, see fig. 14). On the way back to the railroad and again near Pubnico station we were greatly interested in *Spiranthes cernua*, var. *ochroleuca*. Typical white-flowered *S. cernua*, with delicious fragrance suggestive of the Pond Lily, had been common and blooming freely in sterile meadows but this much larger plant with elongate bracts and yellowish flowers of disgustingly pungent odor was just beginning to bloom and grew in dry habitats, either open, sandy fields or rocky barrens.

After making a circuit on the 7th, to secure fruiting material of *Rubus* and other specialties, we quickly packed the boxes and on the 9th sailed on the Prince Arthur, satisfied with our summer's work, though fully conscious that we had barely scratched the surface. Of the more than 2,600 lakes in the silicious belt we have visited exactly 40 and have almost made the circuit of just 1; of the innumerable savannahs and inland marshes we have been on 4; we have not touched the sandy valleys of the Clyde, Roseway, Jordan, Sable and other rivers to the east; the regions where *Ilex opaca* and *Rhododendron maximum* have been reported are still to be investigated; and we have not yet located *Ceratiola*.

But the season was not yet over. Many problems promptly arose as soon as the material was unpacked, so, on October 5, Linder and I sailed on the Prince George back to Yarmouth where we spent three strenuous days, out from sunrise to sunset, collecting fruit of critical groups and adding whatever of novelty the lateness of the season would allow.

A *Bidens* growing in a cold bog at Sand Beach, a plant we had earlier collected in the most immature condition, seems like *B. connata*, var. *gracilipes* Fernald[1] of the Cape Cod quagmires but its achenes are nearly twice as long; apparently an endemic variety. At last we reached Carleton and Kemptville, trailing *Sabatia Kennedy-*

[1] Rhodora xxi. 103 (1919).

ana, *Panicum longifolium*, etc., all the way and later to the head of the East Branch of the Tusket where we also found *Rhexia virginica*, *Proserpinaca pectinata* and *Polygonum robustius*. There are some beautiful savannahs on the East Branch which, earlier in the season, would repay careful exploration. At the border of one was as handsome a *Polygonum* as I ever saw, a slender perennial, obviously a variety of *P. hydropiperoides*, but extremely tall (1–1.5 m.), with leaves almost 2 dm. in length, and with the thick (often 1 cm.) pink spikes sessile in mostly digitate fascicles at the tips of the branches. Typical *P. hydropiperoides*, which we found common in Yarmouth County, has much shorter leaves and the more slender spikes (commonly described as "filiform") scattered along the flowering branches.

This was the end of the collecting but only the beginning of the more exacting and unending task of accurately working out the results—17,000 sheets of carefully prepared specimens representing 3,600 numbers, nearly every isolated species to be intensively studied, lest, like the *Lophiola*, we should superficially place it with the wrong species. And, although the detailed results cannot yet be fully stated, it is now safe to say that, of the indigenous vascular flora of silicious southwestern Nova Scotia, approximately 150 out of the 800 known species are either isolated from the more continuous coastal plain flora of the South or are endemic derivatives from it, while such a typical coastal plain genus as *Bartonia* seems in Nova Scotia to be more highly developed than on the coastal plain itself. Further exploration will greatly increase the proportion of isolated coastal plain types, for we have glimpsed scarcely 1% of the silicious area and most of the significant plants are highly localized and found where least expected. But if there were need of further evidence that, since the Pleistocene glaciation the continental shelf of eastern North America has been high in the air, affording an essentially continuous line of migration across the mouth of the Gulf of Maine to Nova Scotia, thence to Newfoundland, that evidence is now abundantly at hand. A striking feature of this migration northward of the southern coastal plain flora is the fact, that several distinctive species or genera, *Schizaea pusilla* (fig. 11), *Lophiola* (fig. 17), *Habenaria flava*, and perhaps *Ceratiola*, reached Nova Scotia without establishing colonies on Long Island, Cape Cod or Nantucket. This would seem to indicate that the uplifted shelf was a region of some

complexity or else some subtle qualities in the habitats of these plants.

And what of the much overworked life-zones based alone upon temperature? In a region where the Louisianian[1] *Lycopodium inundatum*, var. *Bigelovii* (*L. adpressum*) and the Louisianian and Carolinian *Utricularia subulata* (fig. 4) creep among the bases of *Carex Coodenowii* (Greenland and arctic America, south to Nova Scotia and eastern Massachusetts) or of *Juncus filiformis* (Greenland to Massachusetts and the mountains of Pennsylvania); where the Louisianian and Carolinian *Eleocharis tuberculosa* (fig. 14) vies with *Carex oligosperma* (Labrador to Great Bear Lake, etc.) for the possession of the edge of a savannah; where the dominant undergrowth in the spruce, fir, and larch swamps includes the Louisianian and Carolinian Inkberry (fig. 3), and such a distinctly southern plant as *Solidago Elliottii;* where the Inkberry makes tall thickets with *Ledum groenlandicum* or pushes its branches through the carpet of arctic Crowberry, *Empetrum nigrum* (fig. 2), or the arctic Cloudberry or Bakeapple (*Rubus Chamaemorus*);—in a region where these commінglings of Arctic or Hudsonian with Louisianian or Carolinian species are met at every turn, one is certainly perplexed to make Merriam's zones fit the facts. My friends in the more arid and elevated regions of the West seem to find them of practical value, and in our own upland country they are useful concepts if their use is constantly tempered by that rarest of virtues, sound judgment; but in our humid and lowland regions of the Northeast they are so tangled that it is doubtful whether a commensurate return can be gained from the effort to untangle them. Incidentally, Merriam makes the moose an indicator of the Hudsonian. How lost this great animal must feel in Yarmouth County as it breaks its way through the thickets of Inkberry and tangles of Green Brier to the lake-margins, there to browse on the Louisianian and Carolinian *Brasenia*, *Nymphoides* or *Solidago tenuifolia!*

I have laid great emphasis upon the seemingly unfair proportion of fog and "Scotch mist" in southwestern Nova Scotia, although we were constantly assured that we were having "beginner's luck" and seeing an abnormal summer. I have also indicated the very

[1] The warmer "zones" to which the southern species are accredited are those indicated for them in Mohr's *Plant Life of Alabama*.

diverse habitats of coastal plain plants in that region: *Schizaea pusilla* growing either in the wettest of sphagnous quagmires, in the dryish Cladonia heath or even in rock-crevices; *Woodwardia virginica*, of quaking bogs southward, or *W. areolata*, of our wet or mossy woods, taking to cobble beaches; the Bog Cranberry reaching phenomenal development among quartzite boulders; the Inkberry indifferent whether it grows in the deep shade of spruce woods, on open sphagnous bogs or in dry blueberry pastures; *Panicum Lindheimeri*, of dry open sands southward, represented in Nova Scotia by a plant of inundated quagmires; and *Solidago tenuifolia*, of coastal plain sand-plains, with a Nova Scotian representative found only in the lake-margins. Is not this very general interchange of habitats due, to a great extent, to the unusually moist atmosphere and greatly retarded evaporation? Where there is abundant moisture everywhere the plants secure what they need, even in comparatively dry habitats.

Another point, and the last: in the areas we explored, this remarkable flora derived from the southern coastal plain was restricted to or at least obvious only in the region of acid rock, the "gold-bearing series" and their adjacent granites, the cool Atlantic slope of Nova Scotia or (as on Digby Neck) in extensive areas of acid savannah. Wherever we tapped the regions with limestone, gypsum or basalt, regions with but slightly acid or sweet or basic soils, the coastal plain types were found only on sphagnous bogs or on long-weathered and leached crests or open plains. Instead, as at George River, Port Bevis, Baddeck, Truro, Folleigh, 5-Mile River and the southern slope of the North Mountain, the plants which gave distinction to the regions were such Canadian or Alleghenian calcicoles or denizens of rich woods as *Thelypteris Filix-mas*, *Cystopteris bulbifera* (fig. 6), *Pteretis nodulosa*, *Equisetum scirpoides*, *Milium effusum*, *Sphenopholis pallens*, *Festuca nutans*, *Asperella hystrix*, *Carex rosea*, *C. aurea*, *C. eburnea*, *Juncus Dudleyi*, *Listera convallarioides*, *Ostrya virginiana*, *Laportea canadensis*, *Ranunculus Purshii*, *R. recurvatus*, *Dentaria diphylla*, *Amelanchier canadensis* (fig. 8), *Fragaria vesca*, var. *americana*, *Geum virginianum*, *Geranium Robertianum*, *Shepherdia canadensis*, *Circaea latifolia* and *C. canadensis*, *Aralia racemosa*, *Sanicula gregaria*, *Osmorrhiza Claytoni* and *O. divaricata*, *Satureja vulgaris*, *Solidago latifolia*, *S. serotina* and *Erigeron hyssopifolius* (fig. 7).

These conclusions are based upon careful records, entered every night for more than two months by all members of the party, of everything seen during the day. They show very emphatically that, whereas the distinctive flora of the highly acid but cool Atlantic slope of Nova Scotia has been derived very largely from the now submerged continental shelf and has its affinities far to the south, the distinctive flora of the warmer, inland and less acid or even calcareous regions of the province, the regions of farms and apple and peach orchards, has come from the north, northwest or west by way of New Brunswick. This situation suggests the contrasts in the flora of Newfoundland elsewhere discussed,[1] where the cold, foggy and bleak acid southeastern region is distinguished by a flora derived from the acid sands and peats of the southern coastal plain; the warmer, sunny, calcareous western region by a calcicolous flora allied to those of the calcareous Arctic Archipelago and the Canadian Rocky Mountains.

(To be continued.)

OLD-TIME CONNECTICUT BOTANISTS AND THEIR HERBARIA,—II.

C. A. Weatherby.

(Continued from p. 125.)

Barratt's botanical activities began in England and extended, apparently, to about 1845. There is a specimen in his herbarium dated 1867, but most of his collecting was done before the former date. As a botanist, his impulse was toward research and original work. He was interested in the life history and morphology of plants. On a sheet preserved with one of his letters to Torrey are acute observations on such subjects as the bulblets of *Nymphoides* and their function and the germination of the seeds of *Orontium*. Groups which were taxonomically difficult or insufficiently studied attracted him. Of them he collected freely, to show their different forms, both for himself and abundant duplicates for his correspondents. "I constantly take in my carriage" he wrote to Torrey, "one or 2 large portfolios and collect through the season a great number of our finest and rarest plants." One hopes that no patient's colic had

[1] Fernald, Am. Journ. Bot. v. 237–247 (1918).

to wait when the good doctor spied a particularly fine and rare specimen by the roadside. He made the first and in some cases the only local collection yet known of certain of the rarer plants of Connecticut, such as *Carex trichocarpa*, *Draba caroliniana*, *Solidago canadensis*, *Gnaphalium purpureum* and *Aster radula*—the last at Guilford. But he seems to have missed entirely what we now know as the chief floristic features of his neighborhood—the isolated stations for *Arenaria groenlandica*, var. *glabra*[1] on the hills south of Middletown and for *Carex subulata* in the sand-plains to the north.

At different times he collected and studied especially *Cardamine pennsylvanica*, *Acer*, various species of *Aster* and *Solidago*, *Verbena*, *Lespedeza* and *Desmodium*, the group of *Eupatorium purpureum* and, most notably, *Carex* and *Salix*. On the last genus his most considerable botanical work was done. He studied it as opportunity offered, for ten years, growing willows in the gardens of obliging friends, watching them in the wild and making many and complete specimens in flower, fruit and leaf. By 1834 he had in manuscript and read before the New York Lyceum a "monograph of North American willows" which he planned to publish with drawings of all the species. Lack of the necessary funds prevented this project from being carried out—a state of things still not unfamiliar to scientists. Even so, his work attracted the attention of Sir William Hooker, then engaged in preparing his Flora of British North America, and, we may well believe, puzzled by the complex forms which even his comparatively small collection of willows presented. He sent to Barratt all his North American specimens to be named and invited him to contribute the treatment of the genus to his flora. This Barratt declined to do in detail, but he did present a synopsis of sections which Hooker used and notes on the species from which Hooker published three new species and two varieties ascribed to Barratt as author. Later, in 1840, Barratt himself published a title page and set of printed labels with introduction and notes intended to go with bound volumes of exsiccatae such as were fashionable in those days. The specimens which were to accompany them were, with one exception, all of his own collecting and from the vicinity of Middletown.

Since all of Barratt's publications are rare, a somewhat detailed

[1] The earliest known collection of this is by Merrill Hitchcock, May 4, 1878, 25 days before that of H. L. Osborn cited in the Catalogue of Connecticut Plants.

account of them may not be out of place. Among the willows, he recognizes 29 species (fourteen or fifteen more than current manuals admit in this region), four of them indicated as new though only three are properly published, and fourteen varieties, two unnamed, eleven with *nomina nuda* and one with a brief description. This one, *Salix tristis*, var. *monadelphia*, is an apparently teratological form in which the filaments are united, as they normally are in *S. purpurea*. Barratt distributed his 29 species among eight sections, using as diagnostic characters the time of appearance of the aments, whether before or after the leaves, the point on the ament, apex, middle, or base, at which the staminate flowers first appear, shape of leaves and type of pubescence on them, color of scales, etc. A vast deal of patient labor and observation went into this work and though the sections are in some cases separated by what are now regarded as no more than specific differences and some of the species are either hybrids or divided by finer lines than later students have been able to draw, yet the grouping is essentially that now in use in our current manuals.

Barratt issued similar exsiccatae sets with printed title-page and label-sheets, of the local Carices and Eupatoriums of the *E. purpureum* group. The former contains 67 species, mostly recognized now, and some dozen varieties, only two of which, *C. vulpinoidea*, vars. *glomerata* and *ambigua*,[1] are described. Some of the varietal *nomina nuda* are applied to segregates now recognized—the plants, for instance, now known as *Carex virescens*, var. *Swanii* and *C. vesicaria*, var. *jejuna*. Others seem to be based on wholly trivial and superficial characters. A case in point is that of *C. squarrosa* and *C. typhina*, related species which grow together in the flood-plain of the Connecticut River. Barratt entirely overlooked, or thought of no account, the characters of leaves, scales, form of spike and achene by which they are separated, lumped both together under one species and divided the aggregate into five unnamed varieties based entirely on the number of fruiting spikes.

In his work on the Eupatoria, he anticipates our latest treatment by dividing the group of *E. purpureum* into four species, one new—to which he adds three varieties. The new species, *E. fistulosum*, is

[1] The former is a state of *C. vulpinoidea* with short, thick inflorescence; the latter is, of course, *C. setacea*, var. *ambigua* of Gray's Manual, *C. xanthocarpa* and *C. annectens* of Bicknell.

separated on the basis of its glaucous, hollow stems, which he says, the workmen in the brownstone quarries were wont to fill with powder and use as fuses. The two recent attempts to unravel the synonymy of this group agree that Barratt was here redescribing a Linnaean species;[1] but, as they flatly disagree as to what Linnaean species, Barratt's name may yet bring peace by taking possession of the field. In the other species recognized, the stem is described as solid and glabrous in *E. purpureum*, hispid or pubescent and glandular in *E. maculatum* and *E. ternifolium*.

Barratt planned other, more pretentious botanical works—the monograph of willows already mentioned and a local flora of Middletown which should be "creditable to this place and myself." How far the latter may have proceeded in manuscript there is now no means of telling: local botanists may well be sorry it was never brought to completion. For some reason Barratt never got anything into Silliman's Journal; and the three sets of exsiccatae label-sheets, with their accompanying notes, and a brief article on White Mountain plants collected by one of his pupils, E. W. Southwick, in 1841, make up the sum of his published botanical work.

Barratt's herbarium is preserved at Wesleyan University. Like so much of his work, it is a thing half-finished. Not more than half of his American plants and none of his European ones are mounted; numerous duplicates were left to lie precariously in folders with loose labels. The collection was no doubt neglected in Barratt's later years, and for a long time the University was not in a position to give it needed attention. The herbarium beetle is ubiquitous and not in the habit of letting opportunity knock in vain. So it has happened that the greater part of Barratt's flowering material of the willows and a good many specimens in *Compositae* and other groups which appeal to larval appetites are utterly ruined, and others damaged. There remain, however, somewhat less than 10,000 sheets which, in spite of everything, still constitute a valuable collection, not altogether unworthy of the pride which Barratt once took in it. For that time, the specimens are unusually ample. One very tall plant of *Solidago altissima* is cut into sections and mounted on a series of sheets duly indicated—a method with which few contemporary botanists would have troubled themselves. The specimens are carefully

[1] See Rhodora, xxii. 57ff. and 157ff.

made and mounted, when at all, with equal care—attached with glue in the modern way to paper corresponding to the ledger paper of today in sheets cut 10¾ by 15¼ inches. Barratt was particular about this paper and speaks of having it made to order for him. Like most botanists of his time, he was not so particular about data. However, a good proportion of his plants are fully labelled with date and place of collection and collector's name. Others have a place without a date or a date without a place, and too many only the name of the plant and some references to literature. But in respect to data his herbarium is a model compared to that of Brace.[1] There are specimens from many American botanists of the period. S. B. Buckley, once his pupil, sent him numerous plants from the central and southern United States, in particular a fine set of southern *Rynchospora*. There is original material of *Cyperus diandrus* from Torrey, *Euphorbia Darlingtonii* from Darlington and *Carex Barrattii* from Knieskern. There are a number of duplicates of Hooker's willows from the collections of Drummond in the Rocky Mountains and of Richardson and Morison in arctic North America. Chapman, Le Conte, Sartwell, Boykin, Short, J. Hale, Schweinitz, Dewey, Carey, Sullivant, Lapham, Boott and Oakes are among the names which appear on his labels. From Europe he has plants from H. Shepard of the Liverpool Botanic Garden, John Ball, J. S. Henslow, De Candolle, Jacquin, etc. Of his own collecting there are a good many plants from near Philipstown, a few from the White Mountains and central New York and a representation of the local flora about Middletown which is very fair throughout and excellent in the groups which he especially studied. With some assistance from later collections it would still serve as a good basis for a catalogue of the local plants.

I am indebted for generous aid in the preparation of this paper to Miss Laura Philbrook, formerly of the Middletown Public Library; Professor William North Rice of Wesleyan University; Dr. John Hendley Barnhart of the New York Botanical Garden; and especially to Mr. John H. Sage of Portland, Conn., without whose interest and co-operation I could hardly have secured many needed facts, and Mr. C. H. Bissell of Southington, Conn., who first suggested the writing of such a paper and who had so large a part in the preliminary work

[1] See RHODORA, XVI. 83ff.

on it that, except for its phrasing and its faults, he is as much its author as I.

The following lists may perhaps be of service.

I

Species and varieties published by Barratt, or by others from his notes and over his name, of which there is original material in his herbarium.

Carex vulpinoidea, var. ambigua, Suppl. N. Am. Carices, no. 62 (1841).
Carex vulpinoidea, var. glomerata, l. c. no. 61 (1841).
Eupatorium fistulosum, Eupatoria Verticillata no. 1 (1841).
Salix balsamifera in Anderss. Oefvers. Vet. Akad. Foerhandl. xv. 125 (1858) (a single leaf only).
Salix crassa, Sal. Am. no. 7 (1840).
Salix Drummondiana in Hook. Fl. Bor. Am. ii. 144 (1840).
Salix pameachiana, Sal. Am. no. 16 (1840).
Salix Scouleriana in Hook. Fl. Bor. Am. ii. 144 (1840) (probably this species, though labelled by mistake S. Hookeriana).
Salix Torreyana, Sal. Am. no. 29 (1840).
Salix tristis, var. monadelphia, l. c. no. 2.

Other material of Barratt's willows may be found in the Torrey Herbarium at the New York Botanical Garden, and the Gray Herbarium and, no doubt, at Kew. The identity of most of his species not already well understood has been worked out by Mr. Camillo Schneider in his recent series of notes on North American Willows in the Botanical Gazette and the Journal of the Arnold Arboretum.

II

Barratt's publications, so far as known to me, exclusive of letters and other articles in newspapers, of which there are a considerable number in the one complete file extant of the Middletown *Sentinel and Witness*. All items here listed, except as otherwise noted, were published at Middletown and bear the imprint of C. H. Pelton. Nos. 2, 3, 4, and 5 are label-sheets, printed on one side of the paper only. An official acknowledgment from the Linnaean Society of London of a gift of pamphlets, etc., from Barratt, dated March 5, 1842, mentions another publication which I have not seen—"Remarks on the Canker Worm Moth."

1. Plan of Main St., Middletown, showing the buildings and occupants, from about 1770 to 1775. In J. W. Barber, Connecti-

cut Historical Collections, 508. New Haven and Hartford. 1868.
2. Salices Americanae. North American Willows Disposed in Sections or Natural Groups. 1840. 8pp. qto.
3. North American Carices. 1840. 4 octavo pages.
4. Supplement to the North American Carices. 1841. 1 8vo page.
5. Eupatoria Verticillata: specimens to illustrate the North American verticillate species and varieties of the genus Eupatorium. 1841. 1 folio page.
6. List of Plants collected by Mr. E. W. Southwick on the White Mountains of New Hampshire, July 15, 1841. The Classic ii. 182–185. 1842. Also reprinted, with changed pagination, together with Southwick's Notes of a Tour to the White Hills of N. H., to which it is in the nature of an appendix.
7. Table to show the period and continuance of Flowering of the Apricot, Peach, Cherry and Apple at Middletown, Connecticut. . . Ann. Report of the Regents of the University of the State of New York lviii. 218–129. 1845.
8. Report on the Season of 1846. 1846. 14 pp. Gives tables of the time of flowering of fruit trees from 1837 to 1846 and of dates of late spring and early fall frosts, etc.
9. Key to the Indian Language of New England in the Etchemin or Passamaquoddy Language. . derived and written from the Indian Nicola Tenesles. 1850. 8pp.
10. Indian Proprietors of Mattabeseck and their descendants whose names appear in the town Records from 1673 to 1749. In Addresses delivered at the Dedication of the Indian Hill Cemetery, 47 – 50, Middletown, 1850. Reprinted in Indian Hill Cemetery: By laws, Regulations, etc. 1873.
11. The Indian of New England and the northeastern Provinces . . . . . derived from Nicola Tenesles. 1851. 24pp.
12. Fossil Wonders of a former World. 1874. 7pp.

East Hartford, Connecticut.

NOTES ON RHODODENDRON.

W. W. Ashe.

Rhododendron carolinianum **margarettae** n. var. A shrub in habit resembling the type.[1] Flowers pure white, except for pale yellow spots on the upper lobe of corolla and anthers, appearing be-

[1] Rhod. **14**: 97 (1912).

fore the new leaves from April 10 to May 15 in erect compact 6- to 12-flowered clusters which are from 4 to 6 cm. long; corolla rotate, scarcely two lipped, about 3 cm. wide, the narrow slightly glandular-viscid tube about 5 mm. long, outside of the lobes sparingly lepidote with 3–7 rows of scales; filaments exserted, from 1.6 to 2.6 cm. long, hairy below the middle, the tips upcurved and capped by bright rose colored anthers; style with clavate stigma, much shorter than the stamens, recurved after anthesis; calyx lobes green, semicircular, fringed with scattered 2 to 3 mm. long, weak mostly caducous cilia; pedicels .5 to 2 cm. long, sparingly glandular-viscid; capsule .8 to 1.2 cm. long, lanceolate, truncate. Leaves oblong, 5 to 10 cm. long, 2 to 3 cm. wide, pointed at each end or rarely obtuse at base, dark green above, pale as if glaucous and gray lepidote beneath, petioles green or at length bright red or orange, 1 to 1.5 cm. long. This form differs from the type in its pure white flowers, filaments often villous nearly to the middle, stamens longer than the corolla, the style much shorter than the stamens and the lower surface of the leaves which as a rule are acute at both ends, usually pale and grayish or silvery lepidote.

The variety occurs in rocky woods and on cliffs, especially near small streams, between 1500 and 4000 feet altitude along the Blue Ridge in North Carolina, in McDowell and Buncombe Counties, especially above Old Fort along Curtis, Jarrett and Mill Creeks; in Rutherford County in Hickorynut Gap where abundantly associated with *R. minus;* and in Polk and Henderson Counties above Tryon. Type material collected by W. W. A., May 16, 1905, on the headwaters of Mill Creek and since been in cultivation. A specimen cited by Rehder as belonging to *R. caroliniamum*, No. 4463, Biltmore Herbarium, was collected near Tryon. Two trips have been made to study this Rhododendron in this section where it is not uncommon and many plants were found in full flower. All of these had pure white flowers and this seems to be the color of all of the early flowering plants in this section and in the collection cited above.

The original station for the rose-purple form now in cultivation is the eastern face of Grandfather Mountain, North Carolina, at an altitude of about 5000 feet. It was studied there in April, 1914, when in full flower and since that date other specimens of this form have been collected at various stations in this general vicinity and a plant of it cultivated. The rose-purple form along the Blue Ridge,

which is the only section where it has been possible to work out the detailed distribution, is confined to the higher altitudes above 4000 feet, growing on exposed rocks and cliffs and on such sites is frequent around the rim of the great amphitheater, which begins at Table Rock Mountain and ends at the cliffs beneath Blowing Rock embracing the rocky slopes of Grandfather Mountain. The white flowered form is not known to grow within this zone.

Beginning on Buck Creek above Marion, N. C., and from thence southward along the Blue Ridge to the headwaters of the Pacolet River the white-flowered form is common and seemingly the only early flowering form between altitudes of 1500 and 3500 feet. The white flowered form by its definite distribution and its restriction to lower altitudes seems to be sufficiently well marked to justify separating it as a variety from the rose purple-flowered plant.

RHODODENDRON ATLANTICUM Rehd. (*Azalea atlantica* Ashe) was described from material collected near Georgetown, S. C., in 1916. Specimens of this have recently been found in a package of plants collected near New Berne, N. C., in 1896, and also specimens of **R. neglectum** n. c. (*Azalea neglecta* Ashe, Bul. Tor. Bot. Cl. **47**: 581, 1920). These early flowering azaleas which have undoubtedly been confused with *Rhododendron viscosum* should be looked for at other points along the Atlantic Coastal plains. Both of them grow well in cultivation at Washington, D. C. *R. atlanticum* has a white corolla rarely purplish in the bud and sometimes becoming purplish as it wilts, its divisions much shorter than the very viscid-pubescent funnelform tube. *R. neglectum* has a violet rose-colored corolla becoming whitish as it wilts, the narrow wide-spreading divisions as long as the villous, cylindrous tube, which is not glandular viscid.

DEAM'S TREES OF INDIANA (REVISED EDITION).[1]—The popular demand for Mr. Deam's first revision, which appeared in March, 1919,[2] was so great that the edition of 1000 copies was exhausted within five days after its publication. The Conservation Commission has

[1] Deam, Chas. C. The trees of Indiana. First Revised Edition. Publication No. 13, Department of Conservation, State of Indiana, Apr. 1921. Pp 317, 134 plates.

[2] Reviewed in RHODORA **21**: 188–191. 1919.

accordingly authorized another revision, which has been entirely rewritten along the general lines of the original edition. The most noteworthy changes observed are (1) the use of the International Code of nomenclature in place of the "American" (2) the substitution in the plates of photographs for drawings. Unfortunately these photographs are of (often fragmentary) herbarium specimens rather than of living plants, and have been executed with a very inferior lens and an inadequate background.

The present edition includes 131 species, 19 varieties, and 3 hybrids, representing 47 genera in 26 families. *Crataegus* under Eggleston's treatment continues to head the list in number of species (22), but several of these are not "trees" in the sense in which that term is restricted elsewhere in the book. The author has included a number of varieties recently proposed by Sargent, but without any great degree of enthusiasm, seeming inclined to regard most of these as not clearly distinguished. The most notable additions to the list of species presented in the former edition are perhaps *Salix discolor*, *Prunus hortulana*, *Oxydendrum arboreum* and *Fraxinus lanceolata*. Other additions are mostly the result of new views as to specific limits.

Considerable semi-popular material has found its way into the sections headed "Remarks," as seems inevitable in a work that must run the gauntlet of legislative approval. The key continues to be constructed without regard to floral characters. The many typographical errors of the previous edition have been in great part eliminated, and the attempt to indicate derivation of generic names has been wisely abandoned. The book will be of great service to all students of forestry, and is well adapted to the use of pupils in the public schools.—James C. Nelson, Salem, Oregon.

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Rhodora

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Vol. 23. August. 1921. No. 272.

LINCOLN WARE RIDDLE.

(Born in Jamaica Plain, October 17, 1880
Died in Cambridge, January 16, 1921.)

ROLAND THAXTER.

THE death of Dr. Riddle, in the prime of life and with everything to live for, will not only be mourned by the many friends to whom his lovable nature and winning personality had endeared him; but has also brought keen regret to those who have at heart the advancement of the less cultivated botanical fields to which he had turned his attention. With the prospect of many years of productive activity before him, he had but just realized the height of his professional ambition, through his Harvard appointment, which had brought with it almost ideal conditions for the accomplishment of the work which he wished to do.

With reference to his early choice of a profession, it is somewhat remarkable that this was made when, at the age of twelve, he was a pupil at the Roxbury Latin School. Having occasion to use for the first time certain botanical books, he became so interested in their contents that he determined to devote his life to the study of this subject—a purpose from which he is said never to have wavered until his desire to become a professional botanist was an accomplished fact.

Graduating at Harvard in the class of 1902, he took the degree of A. M. in 1904 and of Ph. D. in 1906. In June of this year he was married to Miss Gertrude Hollister Paine and in the autumn they made their home in Wellesley, where he had been appointed Instruc-

tor in Botany, taking the place of Professor Clara E. Cummings during her absence on leave. After the death of Miss Cummings, which occurred in the spring of 1907, he continued his service in Wellesley College, and was advanced, until in 1917, he was made full professor.

On leaving Harvard, where his interest had led him to specialize, and to write his thesis, in Cryptogamic Botany, he wisely resolved not to suffer his scientific activity to be submerged by the routine of teaching in a woman's college, and to avoid this danger at the very outset by making himself an expert in some special field of botanical research.

His selection of this special field, in which he later won distinction, was determined by the presence at Wellesley of the important Lichen Herbarium which had been accumulated by Miss Cummings, and which came under his charge after her death. Having this herbarium at hand for constant reference, and the unique collection at Harvard within easy reach, he had an unusual opportunity of which he took every advantage; so that, at the time of his death, he and his work were well known to lichenologists both in this country and in Europe.

In everything to which he turned his attention, he was careful and methodical, systematizing his activities so as to make the most complete use of his time. Always keeping in mind the necessity for counteracting the narrowing influence of intensive application to a single specialty, he was deliberate in his cultivation of other and varied interests: civic activities in the Wellesley Community: college administration and student interests: extensive and varied reading of general literature, especially in History and the English Classics, the thoroughness of which is attested by the copious "memoranda from books read" which he has left.

In addition to these and other factors, his horizon was further broadened by a trip to Europe, during a year's leave of absence in 1913, where he made special studies in the lichen collections at London, Paris, Geneva, Upsala, Helsingfors, etc., and became personally acquainted with various European botanists.

In the spring of 1919 he received the appointment of Assistant Professor of Cryptogamic Botany and Associate Curator of the Cryptogamic Herbarium at Harvard, and had served

but a single year when he was attacked by the long illness which terminated fatally on the 16th of January last.

Dr. Riddle always took an active interest in the affairs of the New England Botanical Club, and was its Cryptogamic Curator from 1916 to 1917; its President from 1917 to 1920, and shortly before he was taken ill, had been chosen an associate editor of Rhodora, to fill the vacancy left by the death of Mr F. S. Collins. He was also associate editor of the Bryologist from 1911, a Fellow of the American Academy of Arts and Sciences and member of the Botanical Society of America.

His published work deals almost entirely with systematic Lichenology, although, in his last published paper on Acrospermum, he had begun to carry out his purpose of turning his attention to other fields. The list of his publications is as follows:

1906. Contributions to the Cytology of the Entomophthoraceae: Preliminary Communication. Rhodora **8**: 67–68.

On the Cytology of the Entomophthoraceae. Proc. Am. Acad. Arts & Sci. **42**: 177, Plates 1–3.

1907. Notothylas orbicularis in Massachusetts. Rhodora **9**: 219.

1909. Notes on some Lichens from the Gaspé Peninsula. Rhodora **11**: 100.

A Key to the Species and Principal Varieties of Cladonia occurring in New England. Rhodora **11**: 212.

Check-list of New England Cladoniaceae. Rhodora **11**: 215.

1910. The North American Species of Stereocaulon. Bot. Gazette **50**: 285.

Review of Fink's Lichens of Minnesota. Bryologist **13**: 97.

1911. The Rediscovery of Parmelia lophyrea Ach. Bryologist **14**: 35.

Review of Herre's Lichen-Flora of the Santa Cruz Peninsula. Bryologist **14**: 6.

Geographical Distribution of Lichens in Maine [Abstract] Bull. Josselyn Bot. Soc. Maine **4**: 9–10.

1912. An Enumeration of Lichens Collected by Clara Eaton Cummings in Jamaica. Mycologia **4**: 125.

Review A Recent Contribution to the Ecology of Mosses. Bryologist **15**: 67.

1915. Report on the Lichens in N. L. Britton: The Vegetation of Mona Island. Ann. Mo. Bot. Garden **2**: 35 and 51.
An Undescribed Species of Cetraria. Bryologist **18**: 27.
1916. The Lichens of Bermuda. Bull. Torrey Bot. Club **43**: 145.
Report on the Lichens in N. L. Britton: The Vegetation of Anegada Island. Mem. N. Y. Bot. Garden **6**: 579.
1917. Some Noteworthy Lichens from Jamaica. Bull. Torrey Bot. Club **44**: 321.
The Genus Parmeliopsis of Nylander. Bryologist **20**: 69; plate & fig.
Pyrenothrix nigra gen. et sp. nov. Botanical Gazette **64**: 513. figs.
1918. Some Extensions of Ranges. Bryologist **21**: 50.
Report on the Lichens in N. L. Britton: The Flora of the American Virgin Islands. Mem. Brooklyn Bot. Gard. **1**: 109 with text figures.
Chapter on Lichens in N. L. Britton: The Flora of Bermuda, p. 470.
1920. William Gilson Farlow. Rhodora **22**: 1.
Observations on the Genus Acrospermum. Mycologia **12**:
Treatment of the Lichens in N. L. Britton & C. F. Millspaugh: The Bahama Flora, pp. 522–553.

THE GRAY HERBARIUM EXPEDITION TO NOVA SCOTIA 1920.

M. L. Fernald.

(*Continued from p. 171*)

Part 11. Noteworthy Vascular Plants collected in Nova Scotia, 1920.

The published lists of Nova Scotian plants contain so very few records from Digby, Yarmouth, Shelburne, and Queens Counties that it is desirable to make our records from these western counties rather detailed and to enumerate all species which seem to be characteristic of this region as contrasted with the northern and eastern counties. Many species which abound from Digby Neck and An-

napolis County to Cape Breton, in the regions of calcareous or sweet soils, are very rare in the acid western and southwestern counties and, consequently, so far as our limited and somewhat negative observations allow, special note is made of these plants. A large number seen wherever we went, from Yarmouth to Cape Breton—such species as *Polypodium vulgare* L., *Polystichum acrostichoides* (Michx.) Schott, *Onoclea sensibilis* L., *Osmunda cinnamomea* L., *Taxus canadensis* Willd., *Pinus Strobus* L., etc.—are not here specially noted, although species belonging to recently revised genera are freely enumerated. In the following enumerations, the 110 species of plants marked ** are new to the flora of Canada, while the additional 122 marked * are here recorded for the first time, apparently, from Nova Scotia. The names of introduced species are in italics. The International Rules of Botanical Nomenclature are followed.

WOODWARDIA VIRGINICA (L.) Sm. Swampy spruce woods, boggy margins of lakes, savannahs and cobbly lake-shores, rather general in Yarmouth and Queens Cos. See pp. 109, 147, 150, 166, 170. Earlier records eastward to Halifax Co.

** W. AREOLATA (L.) Moore. Very locally in YARMOUTH Co.: upper border of cobble-beach of Butler's (Gavelton) Lake, Gavelton; wet thicket at border of west shore of Randel Lake, Argyle. See pp. 149, 166, 170.

ATHYRIUM ACROSTICHOIDES (Sw.) Diels. *Asplenium acrostichoides* Sw. Rich or calcareous woods. HANTS Co.: Five-Mile River. CAPE BRETON Co.: George River. Various ealirer records from Hants and Halifax Cos. to Inverness. See pp. 136, 165.

A. ANGUSTUM (Willd.) Presl.[1] Apparently less common southwestward than var. *rubellum*. Collected at Port Mouton (Queens) and at George River (Cape Breton Co.).

** A. ANGUSTUM, var. ELATIUS (Link) Butters, RHODORA, xix. 191 (1917). YARMOUTH Co.: swampy woods by Eel Lake. Previously known to extend eastward to south-central Maine—see RHODORA, xxii. 84 (1920).

A. ANGUSTUM, var RUBELLUM (Gilbert) Butters, l. c. 193 (1917). The common form of the species at least from Yarmouth Co. to Queens Co.

POLYSTICHUM BRAUNII (Spenner) Fée. To the several records from rich or calcareous areas from Kings Co. to Cape Breton may be added Folleigh, Colchester Co. (see p. 136) and George River, Cape Breton Co.

[1] For discussion of *Athyrium angustum* (*Asplenium Filix-femina* of eastern America, in great part) see Butters, RHODORA xix. 190 (1917).

** THELYPTERIS PALUSTRIS Schmidel, forma SUAVEOLENS (Clute) Fernald, RHODORA, xxiii. 165 (1921). Open spruce and fir thickets along brook at head of Baddeck Bay, Baddeck.

** T. SIMULATA (Davenp.) Niewl., Am. Midl. Nat. i. 226 (1910). *Aspidium simulatum* Davenp. Local, probably somewhat general, Yarmouth Co. to Queens Co. YARMOUTH Co.: boggy swales and thickets bordering Lily Lake (near Yarmouth); wet alder thicket at southwest corner of Salmon (Greenville) Lake; bushy knolls in wet peaty barrens, Lower Argyle. QUEENS Co.: knolls in wet sphagnous spruce bog near Louis Lake, Port Joli; knolls in springy sphagnous bog in spruce woods, near mouth of Broad River. See pp. 104, 154, 156, 158.

T. MARGINALIS (L.) Nieuwl., l. c. (1910). *Aspidium marginale* (L.) Sw. Although common eastward, apparently rare in the southwestern counties. Seen by us in Yarmouth Co. only near Randel Lake, Argyle.

T. FILIX-MAS (L.) Nieuwl., l. c. (1910). To the numerous stations on Cape Breton Island may be added the region about the limestone quarry, George River. See pp. 165, 170.

T. BOOTTII (Tuckerm.) Nieuwl., l. c. Frequent in swampy woods and thickets of Yarmouth Co. See pp. 104. Jack records it from Halifax Co.

CYSTOPTERIS BULBIFERA (L.) Bernh. Abundant in open woods about limestone and gypsum outcrops; Five-Mile River (Hants), Port Bevis (Victoria) and George River (Cape Breton). See pp. 136, 164, 170. Previously recorded from other calcareous areas from Hants to Cape Breton.

C. FRAGILIS (L.) Bernh., var. MACKAYI Lawson, Fern Flora of Canada, 233 (1899). Our only collection was from the vicinity of the limestone quarry at George River (Cape Breton). See p. 165.

PTERETIS NODULOSA (Michx.) Nieuwl. *Onoclea Struthiopteris* of American authors. Alluvial woods and about limestone or gypsum outcrops, Hants, Victoria and Cape Breton Cos. See pp. 136, 164, 170.

SCHIZAEA PUSILLA Pursh. At various stations in Digby, Yarmouth, Queens and Halifax Cos. DIGBY Co.: apparently rare and local in wet peaty hollows in savannahs along Little River east of Tiddville. YARMOUTH Co.: sphagnous bog at outlet of Porcupine Lake, Arcadia; sandy and peaty bog, Sand Pond, Argyle; wet peaty sloughs and quagmire-pools or even in depressions of dryish *Cladonia*-covered barrens west of Goose Lake, Lower Argyle. QUEENS Co.: sphagnous springy bog in spruce woods near mouth of Broad River. HALIFAX Co.: slaty ledges and cobbly upper beach of Shubenacadie Grand Lake, near Mrs. Britton's station. See pp. 91, 99, 103, 134, 135, 148, 153, 161, 168, 170.

OPHIOGLOSSUM VULGATUM L. Frequent in damp sandy and cobbly beaches of lakes or in sterile meadows, Digby and Yarmouth Cos. Varying from large plants to the smallest extreme (Var. *minus* Moore, *O. arenarium* E. G. Britton) in different portions of individual colonies. See pp. 141, 142.

BOTRYCHIUM SIMPLEX E. Hitchc. Rare: a small colony of extremely dwarf plants, sandy and gravelly beach of Cedar Lake, Yarmouth Co. See p. 102.

B. RAMOSUM (Roth) Aschers. Rare: a solitary plant in mixed woods, southern slope of North Mt., Middleton; previously recorded from Blomidon northward and eastward.

B. DISSECTUM Spreng. and forma OBLIQUUM (Muhl.) Fernald, RHODORA, xxiii. 151 (1921). Frequent or common in sandy or gravelly, either open or turfy soils of Digby, Yarmouth and Shelburne Cos. Recorded by others eastward to Halifax Co. See pp. 141, 151.

B. TERNATUM (Thunb.) Sw., var. RUTAEFOLIUM (A. Br.) DC. Apparently rare in or absent from the southwestern section: seen only at Cedar Lake, Digby Co.

* EQUISETUM LITORALE Kuehl. Very abundant on the wet lower gravelly beach of Shubenacadie Grand Lake (Halifax Co.).

* E. LIMOSUM L., forma POLYSTACHIUM (Brueckn.) Doell; Fernald & Weatherby, RHODORA, xxiii. 47 (1921). Boggy thicket, Hectanooga. See p. 97.

E. HYEMALE L., var. AFFINE (Englm.) A. A. Eaton. Light sandy or gravelly banks, railroad embankments, etc., through the northern and northwestern counties, west to banks of Sissiboo River, Digby Co.

E. SCIRPOIDES Michx. Rich wooded banks and mossy slopes, Cape Breton to the North Mt., Annapolis Co. See pp. 133, 139, 170.

LYCOPODIUM INUNDATUM L. Common throughout the province.

L. INUNDATUM L., var. BIGELOVII Tuckerm. Sandy and peaty beaches of lakes and in boggy savannahs, common in Digby and Yarmouth Cos. To be expected eastward. Reported in Macoun's Catalogue from Grand Lake, Halifax Co. and from North Sydney and Louisburg, Cape Breton; but the only specimens we have seen of Macoun's material from North Sydney are not characteristic. See pp. 99, 100, 161, 169.

L. ANNOTINUM L., var. ACRIFOLIUM Fernald, RHODORA, xvii. 124 (1915). Less common than typical *L. annotinum*. Seen by us only in spruce and maple swamps by Clement Pond, Barrington (Shelburne Co.) and on a dry bank at Hectanooga (Yarmouth Co.).

L. CLAVATUM L., var. MEGASTACHYON Fernald & Bissell, RHODORA, xii. 53 (1910). Frequent throughout the province.

L. OBSCURUM L. The current descriptions of the two well defined

varieties of this species are often misinterpreted, with the result that much of typical *L. obscurum* is passing as var. *dendroideum*. The two varieties may ordinarily be distinguished as follows:

Branches spreading or recurving, flattened or concave beneath: the linear-lanceolate leaves about 1 mm. broad; the lower (and often the upper) series usually appressed; the lateral spreading: spikes 1.5–4 cm. long, 4–6 mm. thick.
L. obscurum (typical).

Branches erect and crowded, not obviously flattened: the linear-attenuate leaves decidedly less than 1 mm. broad, all incurved-ascending: spikes 2–5 cm. long, 3.5–4.5 mm. thick.
Var. *dendroideum*.

L. OBSCURUM L. The typical form of the plant is common in Nova Scotia.

* L. OBSCURUM, var. DENDROIDEUM (Michx.) D. C. Eaton. Frequent in dry open woods and pastures or clearings, Yarmouth Co. to Lunenburg Co.

* L. COMPLANATUM L. Decidedly rare as compared with the common var. FLABELLIFORME Fernald. Seen only in CAPE BRETON Co.: spruce woods on hill across the river from the quarry, George River.

L. TRISTACHYUM Pursh. Dry barrens, sandy woods and gravelly embankments, apparently frequent throughout. See p. 130.

ISOETES TUCKERMANI A. Br. The abundant species everywhere in the margins of ponds in the silicious regions of the province. In argillaceous regions passing to the stouter but otherwise hardly distinguishable vars. *borealis* A. A. Eaton and *Harveyi* (A. A. Eaton) Clute.

PINUS BANKSIANA Lamb. According to Fernow (Forest Cond. N. S. 11) "Jack Pine (*Pinus divaricata*) is found only in special localities on poorest sites in Colchester county." In Cumberland Co. it is seen from the train to be abundant, mixed with *P. resinosa*, on the hills between Thomson and Atkinson Siding, and in less abundance about Springhill Junction; both regions composed of sterile Carboniferous sandstone. See p. 130. The conservatism of Fernow's statement is further indicated by Fowler's reference to this as "The most common species of pine" in the region of Canso.—Fowler, Ann. Rep. Dept. Mar. and Fish., xxxix. 59 (1907).

* ABIES BALSAMEA (L.) Mill., var. PHANEROLEPIS Fernald, RHODORA, xi. 203 (1909). With the typical form of the species, boggy barrens west of Goose Lake, Argyle.

THUJA OCCIDENTALIS L. To the rather few stations for White Cedar in Nova Scotia should be added Cedar Lake, Digby and Yarmouth Cos. (near Port Maitland). It is doubtless also at Cedar Lake, east of Corberrie. See pp. 100, 102.

JUNIPERUS COMMUNIS L., var. DEPRESSA Pursh. In Nova Scotia

as on Prince Edward Island as often in wet boggy barrens as on drier habitats.

J. HORIZONTALIS Moench. *J. sabina*, var. *procumbens* Pursh. Although stated by Macoun to be "abundant on exposed slopes and river banks from Anticosti, Nova Scotia, New Brunswick" westward, this species was not once met by our party in the southwestern counties. It is on headlands of the Bay of Fundy and Northumberland Strait and on Sable Island and Cape Breton.

SPARGANIUM AMERICANUM Nutt. Common throughout the province, passing freely to var. ANDROCLADUM (Engelm.) Fernald & Eames. See p. 142.

S. DIVERSIFOLIUM Graebn. Apparently common thoughout the province.

S. DIVERSIFOLIUM, var. ACAULE (Beeby) Fernald & Eames. Frequent.

S. FLUCTUANS (Morong) Robinson. Deep water of Trefry's Lake, Arcadia, Yarmouth Co. See p. 145.

*S. MINIMUM Fries. Apparently local: quiet pools in Little River east of Tiddville, Digby Co. Previously collected by Nichols in a brook, mountains west of Ingonish, Victoria Co.

POTAMOGETON NATANS L. Frequent from Digby Neck to Cape Breton.

*P. OAKESIANUS Robbins. Frequent in shallow peat- or sand-bottomed lakes and pools of Digby and Yarmouth Cos. See pp. 146, 148, 63. Formerly collected at margin of Taylor's Lake, Sunny Brae, Pictou Co. (*H. St. John*, no. 1373).

P. ALPINUS Balbis. Seen by us only at Truro and Baddeck. See p. 164.

**P. PULCHER Tuckerm. Muddy cove in Lily Lake, Sandy Cove, Digby Co. See p. 164.

P. AMPLIFOLIUS Tuckerm. Abundant in Sloane Lake, Pleasant Valley, Yarmouth Co.

P. GRAMINEUS L., var. GRAMINIFOLIUS Fries. Nov. Fl. Suec. ed. 2, 36 (1828); Robbins in Gray, Man. ed. 5, 487 (1867); Freyer, Journ. Bot. xxx. 33, tt. 317, 318 (1892). *P. gramineus*, proles α. *graminifolius* (Fries) Aschers & Graebn. in Engler, Pflanzenr. iv. Fam. 11: 86 (1907). *P. gramineus*, β. *gramineus* Laestad. Vet. Acad. Handl. (1825) 152, acc. to Fries., not *P. graminеum*[*us*] L. Sp. Pl. i. 127 (1753) which, according to Freyer (Pot. Brit. Isl. 65), is *P. heterophyllus* Schreb. *P. gramineus*, var. (?) *myriophyllus* Robbins in Gray, Man. ed. 5, 487 (1867). *P. heterophyllus*, var, *graminifolius* (Fries) Wats. & Coult. in Gray, Man. ed. 6, 561 (1890). *P. heterophyllus* of most recent American authors, not Schreb. *P. graminifolius* (Fries) Freyer, Pot. Brit. Isl. 64, t. 36 (1915).—Ponds, pools, and streams, frequent.

There has always been confusion as to the identity of the common

and highly variable American plant which is here called *P. gramineus*, var. *graminifolius*. In Freyer's *Potamogetons of the British Isles* typical *P. gramineus* L. (= *P. heterophyllus* Schreb.) is figured and described as having the upper stipules strongly divergent and the short peduncles conspicuously thickened at summit, while *P. graminifolius* is illustrated with more appressed-ascending stipules and elongate barely club-shaped peduncles. All American material in the Gray Herbarium and the herbarium of the New England Botanical Club, altogether about 300 sheets, agrees with *P. graminifolius* in these characters, and typical *P. gramineus* or *P. heterophyllus* is rare if not quite unknown in North America. Freyer indicates differences in the fruit, although it is significant that in his description he was obliged to quote from Morong the supposed distinctive characters of the fruit of *P. graminifolius*. These differences, however, do not appear constant and it is noteworthy that many American plants, otherwise good *P. graminifolius* as treated by Freyer, have the fruits quite like his illustrations under *P. gramineus*. It seems best, therefore, to consider *P. graminifolius* a strong variety of the complex *P. gramineus*, as has been so generally the practice for a full century by students of the Pondweeds.

** P. GRAMINEUS, var. SPATHULAEFORMIS Robbins in Gray, Man. ed. 5, 487 (1867). *P. spathaeformis* Tuckerm. ex Robbins, l. c. (1867); Bennett, Journ. Bot. xxxviii. 130 (1900); Fernald, RHODORA, viii. 224 (1906); Robinson & Fernald in Gray, Man. ed. 7, 74 (1908). *P. varians* Morong ex Freyer, Journ. Bot. xxv. 308 (1887), xxvii. 33, t. 287 (1889); Freyer, Pot. Brit. Isl. 67, t. 41 (1915). *P. spathulaeformis* (Robbins) Morong, Mem. Torr. Bot. Cl. iii. pt. 2, 26 (1893), but hardly t. 35 (with attenuate and therefore quite uncharacteristic submersed leaves). *P. Zizii* × *gramineus* Aschers. & Graebn. Synop. Mitteleur. Fl. i. 327, in part (1897). *P. spathuliformis* Asch. & Graebn. in Engler, Pflanzenr. iv. Fam. 11:91 (1907).—Apparently local, collected only once in DIGBY Co.: brook with muddy bottom, outlet of Midway (Centreville) Lake.

Var. *spathulaeformis* was proposed by Robbins with doubt as to its exact affinity because his material from Mystic Pond in Middlesex Co., Massachusetts, was sterile. Newfoundland material from two stations closely matches the original Mystic Pond collections and the material from Grand Falls, Newfoundland (*Fernald & Wiegand*, no. 4475) might well have formed the basis of the plate of *P. varians* in Freyer's *Potamogetons of the British Isles*. Both New-

foundland collections are sparingly fruiting, while the Nova Scotia plant is sterile, but exactly similar material from the Magdalen Islands as well as from southern Maine has good fruit which is quite like that of var. *graminifolius*. In fact, a large series of specimens of var. *spathulaeformis* (from Newfoundland, Anticosti Island, the Magdalen Islands, Nova Scotia, Maine, Massachusetts and Connecticut) seems to be separable from var. *graminifolius* only by its round-tipped or decidedly obtuse submersed leaves. It has been generally surmised that *P. spathaeformis* or *P. varians* is a hybrid of *P. gramineus* or its var. *graminifolius* with *P. angustifolius* Berchtold & Presl; but since the latter species is unknown northeast of Massachusetts, while the supposed hybrid extends as a fertile plant to eastern Newfoundland, its hybrid nature is certainly extremely doubtful. Furthermore, the fertile obtuse-leaved plant of Newfoundland, the Magdalen Islands and Maine has the characteristic small fruit of *P. gramineus* and its var. *graminifolius*.

P. BUPLEUROIDES Fernald. Frequent in brackish waters. Rare in fresh water: seen only in Midway (Centreville) Lake, Centreville, Digby Co. See p. 163.

The characters originally pointed out seem consistently to distinguish *P. bupleuroides* from the European and northern *P. perfoliatus* L. — the less puckered leaf, fewer nerves, slender stem, almost filiform peduncle without much spongy thickening, and smaller, firm and olive-brown fruit. Dr. St. John and I have reviewed the material and find no specimens to match old world *P. perfoliatus* from south of Labrador.

* P. FRIESII Rupr. Seen only in COLCHESTER and CUMBERLAND Cos.: quiet waters of Salmon River, Truro; spring-pools and ditches south of Amherst.

* P. CONFERVOIDES Reichenb. Deep or shallow water of lakes, small ponds and bog-pools, frequent in YARMOUTH Co.: deep water of Trefry's Lake, Arcadia; peaty and muddy pond-hole near head of St. John Lake, Springhaven; water-holes in sphagnous bog by the station, Argyle; drifted ashore from deep water of Great Pubnico Lake. See pp. 145, 149.

* P. DIMORPHUS Raf. Shallow water on tidal flats of Tusket River, Tusket Falls, Yarmouth Co.

* P. FILIFORMIS, var. BOREALIS (Raf.) St. John, RHODORA, XVIII. 134 (1916). Fresh to brackish swale at head of Baddeck Bay, Baddeck.

* P. VAGINATUS Turcz. Bull. Soc. Nat. Moscou, xi. 102 (1838); St. John, RHODORA, XX. 191 (1918). *P. moniliformis* St. John,

Rhodora, xviii. 130 (1916). Cold, shallow brook in woods at head of Baddeck Bay, Baddeck. See p. 164.

P. pectinatus L. Brackish or salt water at various stations from Yarmouth Co. to Cape Breton. See p. 141.

Ruppia maritima L., var. longipes Hagström, Botaniska Notiser (1911) 138; Fernald & Wiegand, Rhodora, xvi. 125 (1914). Brackish water at various points throughout the province. See p. 141.

R. maritima, var. rostrata Agardh in Physiogr. Sällsk. Arsbetr. 6 Maj (1823) 37; Fernald & Wiegand, l. c. Brackish pools in the marshes below Truro.

Zannichellia palustris L., var. major (Boenningh.) Koch. See p. 110. Apparently frequent in brackish or saline waters or on saline mud.

*Zostera marina L., var. stenophylla Aschers. & Graebn. This very slender extreme of the species abounds in Great Bras d'Or Lake in the gravel about Kidstone Island.

Najas flexilis (Willd.) Rostk. & Schmidt. Not seen in Yarmouth, Shelburne and Queens Cos. Occasional elsewhere. See p. 146.

Triglochin palustris L. Characteristic of the fresh to brackish springy inner borders of salt marshes or on brackish sand-flats, throughout. Also in open peaty spots in a spring-fed bog south of Amherst.

*Sagittaria cuneata Sheldon. *S. arifolia* Nutt. Probably somewhat general in the argillaceous regions. Hants Co.: pond-hole near Five-mile River. Cumberland Co.: spring-pools and ditches south of Amherst. See pp. 131, 137.

S. graminea Michx. Margins of ponds and on fresh tidal mud at various stations from Yarmouth Co. to Cape Breton. See p. 146.

**Panicum dichotomiflorum Michx. Seen only in the Tusket Valley, Yarmouth Co.: sandy and gravelly shores and borders of savannahs, Tusket (Vaughan) Lake and Butler's (Gavelton) L., Gavelton. See p. 166.

**P. capillare* L., var. *occidentale* Rydb. See Rhodora, xxi. 111 (1919). Seen only about railroad yards; obviously introduced.

**P. virgatum L., var. cubense of many authors, not Griseb. Gravelly beaches or peaty borders of lakes of Yarmouth Co.: Salmon (Greenville) Lake; St John L., Springhaven; Butler's (Gavelton) L., Gavelton; Great Pubnico L. See p. 156.

P. longifolium Torr., var **tusketense, n. var., planta dense cespitosa 2–7 dm. alta; foliis 3–6 mm. latis glabris; paniculis coarctatis 0.3–1.5 dm. longis ramis plerumque valde adscendentibus; spiculis 2.7–3.4 mm. longis; gluma superiore lemma sterile non aequante caryopsibus ellipsoideis obtusis 1.6–1.8 mm. longis 0.8–0.9 mm latis.

Densely cespitose, 2–7 dm. high: leaves 3–6 mm. wide, glabrous:

panicles contracted, 0.3–1.5 dm. long, mostly with strongly ascending branches: spikelets 2.7–3.4 mm. long; upper glume shorter than the sterile lemma: caryopsis ellipsoid, obtuse, 1.6–1.8 mm. long, 0.8–0.9 mm. wide.—Valley of the Tusket River, NOVA SCOTIA: gravelly margin (northwest side) of Tusket (Vaughan) Lake, August 20, 1920, *Fernald, Bissell, Graves, Long* & *Linder*, no. 19,759; sandy and gravelly beach of Butler's (Gavelton) Lake, Gavelton, September 4, 1920, *Fernald, Long* & *Linder*, no. 19,763; wet peaty margin of Butler's Lake, Gavelton, September 4, *Fernald, Long* & *Linder*, no. 19,764 (TYPE in Gray Herb.); wet peaty shore, East Branch of Tusket River, Gavelton, September 4, *Fernald, Long* & *Linder*, no. 19,765; sandy and gravelly margin of Pearl Lake, Kemptville, October 7, 1920, *Fernald* & *Linder*, no. 19,761; peaty margin of Kegeshook Lake, October 8, 1920, *Fernald* & *Linder*, no. 19,762. See pp. 160, 168.

Differing from typical *P. longifolium* as it occurs from Texas and Florida to New Jersey in its low stature, glabrous and rather broader leaves, very contracted and short panicle, longer spikelets, short upper glume and broad and bluntish grain; the southern plant being mostly 6–8 dm. high, with the usually pilose-based leaves 2–5 mm. wide, the panicle 1–2.5 dm. long and with loosely ascending branches, the spikelets 2.4–2.7 mm. long, the upper glume equaling or longer than the lemma and the slender and acute grain 0.4–0.7 mm. wide. If the material from the South alone were accessible for comparison the Nova Scotian plant would seem a distinct species; but some specimens from New Jersey, Connecticut and Rhode Island show spikelets up to 3 mm. long and grains quite as broad as in the Nova Scotian material, but with the elongate glume and looser panicle of the southern plant; while specimens from Lake Werden, Rhode Island have the panicle as contracted as in the Tusket Valley plant.

P. DEPAUPERATUM Muhl., var. **psilophyllum**, n. var., foliis utrinque glabris vel vaginis sparsissime setulosis.

Leaves wholly glabrous or the sheaths very sparsely setulose. Nova Scotia to Megantic Co., Quebec, Wisconsin and Virginia. TYPE: extremely sterile land, Canton, Maine, July 7, 1906, *J. C. Parlin*, no. 1957 (Gray Herb.). In Nova Scotia known only from Queens, Annapolis and Kings Cos. Macoun records it from Kingston. We collected it in a sandy and gravelly railroad yard at Middleton (Annapolis) and in gravelly soil near the mouth of Broad River (Queens).

The characteristic plant about Middleton, in the undisturbed soil of the dry plains and open woods, completely lacks the large primary panicles on elongate culms and bears only reduced basal panicles of 1–4 spikelets. This extreme form may be called

** P. DEPAUPERATUM, var. PSILOPHYLLUM, forma **cryptostachys**, n. f., paniculis omnino reductis basilaribus, spiculis 1–4.—NOVA SCOTIA: dryish open sandy plains, Middleton, July 20, 1920, *Fernald Pease* & *Long*, no. 19,769 (TYPE in Gray Herb.); dry sandy thickets and borders of woods, Middleton, July 21, *Fernald* & *Pease*, no. 19,770. See p. 138.

Var. *psilophyllum* is the common plant with sheaths sparsely pilose or quite glabrous. This extreme and the plant with copiously pilose sheaths were both included by Muhlenberg in his *P. depauperatum* but by Hitchcock & Chase "a specimen with pilose sheaths . . . has been chosen as the type." Whereas var. *psilophyllum* is the dominant plant of the North, the more pilose extreme is commoner in the southern and central states. Thus, of the 173 sheets of specimens examined from Nova Scotia, Quebec and New England, 152 are var. *psilophyllum* and only 21 the plant with copiously pilose sheaths. Conversely, all the material examined from North Carolina, and Georgia to Arkansas, Missouri and Illinois is typical *P. depauperatum*.[1]

Recently Mr. F. T. Hubbard (RHODORA, xiv. 169) has taken up the name *P. strictum* Pursh (1814) to displace *P. depauperatum* Muhl. (1817) in spite of the earlier *P. strictum* R. Br. (1810); Hubbard citing as a basis for his change Articles 37 and 50 of the International Rules. But the application of Art. 37 (rejecting names published without diagnoses or merely cited in synonymy) is not apparent, for Robert Brown published *P. strictum* as a valid species with careful description. Art. 50 was applied by Hubbard to the case of *P. strictum* Pursh through an obvious misapprehension, for, although *P. strictum* R. Br. is treated in *Index Kewensis* as a synonym of *P. marginatum*, it is not so treated by those who know the plants; Bentham, F. M. Bailey and other students of the Australian flora all maintaining it as at least a good variety, which rests directly

[1] In its greater abundance northward *P. depauperatum*, var. *psilophyllum* is comparable with

P. LINEARIFOLIUM Scribn., var. **Werneri** (Scribn.), n. comb. *P. Werneri* Scribn. in Britton & Brown, Ill. Fl. iii. 501, fig. 268b (1898).

Typical *P. linearifolium* has copiously pilose sheaths, var. *Werneri* glabrous sheaths. The very minute difference in spikelets relied upon by Hitchcock & Chase is very inconstant and wholly unsatisfactory and the only usable distinction is in the sheath. Of 103 sheets examined from Quebec and northern and central New England 76 are var. *Werneri*, 27 the typical form of *P. linearifolium*. Conversely, of 28 sheets examined from Missouri 26 are typical *P. linearifolium* and only 2 var. *Werneri*.

upon *P. strictum* R. Br. The general recognition of *P. strictum* R. Br. as the nomenclatorial basis of a variety does not, as Hubbard seems to infer, render that name "an earlier homonym which is universally regarded as nonvalid" (Art. 50).

P. BOREALE Nash. Abundant in damp or dryish situations throughout the province.

** P. SPRETUM Schultes. Boggy savannahs and peaty, sandy or gravelly upper borders of lake-beaches, eastward to Halifax Co.; sixteen collections from the following stations. DIGBY Co.: Cedar Lake. YARMOUTH Co.: Cedar L.; Beaver L.; Porcupine L., Arcadia; large lake north of Saller L., Kemptville; Fanning L., Carleton; Tusket (Vaughan) L.; Butler's (Gavelton) L., Gavelton; St. John L., Springhaven; Kegeshook L.; Sand Pond. Argyle; Great Pubnico L. HALIFAX Co.: Shubenacadie Grand Lake. See pp. 99, 101, 102, 141.

(To be continued.)

A NEW STATION FOR POGONIA AFFINIS.

E. JEROME GRIMES.

JUNE 1st, 1920, I was lucky enough to find three flowering specimens of that rare, interesting, and much discussed orchid, *Pogonia affinis* Austin, while making a hurried trip through some woods west of Williamsburg, which is situated on the coastal plain about 30 miles west of Norfolk, Virginia. This year the same station was visited the beginning of the second week in May and, by diligent searching throughout the afternoon, fifteen plants each consisting of a flowering shoot were observed. The difference in flowering dates is due to the season, which was three weeks to a month earlier in 1921.

The habitat is a flat dry hardwood on a gently undulating interstream area. The soil is a well drained gray fine sandy loam over a yellowish sandy clay or clay. The vegetation consists chiefly of white oak, beech, tulip and chestnut with a few scattering Loblolly pines, and an abundance of flowering dogwood. The undergrowth is very sparse and the Pogonias were found scattered over an area of about ten acres, occurring either singly or in open groups of two to four plants.

A composite soil sample of the habitat was tested and found to be practically neutral to Brom Thymol Blue, and soil shaken from the

roots of the orchids gave approximately the same reaction. The Pogonias were found in more or less clear spaces in the woods and their roots were always intertwined with decaying organic matter in which the fibres of the plant remains were distinguishable.

Out of the fifteen plants observed, five bore two flowers each, and two plants with solitary flowers had two capsules on the old stem persisting from last year. The maximum and minimum dimensions of the various organs were measured in thirteen plants and are as follows:

Organ	*Dimension*	*Maximum*	*Minimum*	*Mean*
Stem: from root to leaves.	Height	20.0 cm.	9.5 cm.	17 cm.
Leaves	Length	5.8 cm.	2.7 cm.	4.4 cm.
	Width	3.0 cm.	1.1 cm.	2.1 cm.
Ovary and Peduncle	Total Length	2.0 cm.	1.4 cm.	1.6 cm.
Peduncle of old capsule	Length	1.3 cm.	0.8 cm.	1.0 cm.
Capsule	Length	2.7 cm.	1.7 cm.	2.0 cm.
	Width	1.0 cm.	0.8 cm.	0.9 cm.
Sepals	Length	2.3 cm.	1.7 cm.	2.0 cm.
Petals	Length	1.7 cm.	1.3 cm.	1.6 cm.

The orchid is very distinct from the larger whorled Pogonia, *P. verticillata*. *Pogonia affinis* is more delicate in habit and of a much paler green. One of its most noticeable features in the field is the fine bloom which covers the stem and leaves but rubs off very easily when the plant is handled. A slight bloom has been observed on the stem of *P. verticillata* but not on the leaves. The whorl of five leaves in *P. affinis* is close to the base of the ovary so that the short peduncle is not distinguishable to the eye, and all the leaves assume a slightly drooping position, making an angle of about 45 degrees with the stem. All the leaves observed tapered at the apex considerably more than is indicated by the drawing in the Illustrated Flora. No plants were observed to bear a sterile whorl of leaves as is common with *P. verticillata*. The flowers of *Pogonia affinis* are a pale yellowish green when young and some quite yellow when fully mature. The lip however, is almost white and is crested over the whole face and lobes with pale green. After fertilization the short peduncle

elongates to about one centimetre. The young ovary is distinctly ribbed, while the ripe capsule is six angled and three ribbed and dehisces by lateral longitudinal splits on either side of the ribs. At the base of the stem at soil level there are four to five small pointed brown membranous bracts. Time did not permit of prolonged observation and no insect visitors were observed.

In this station *P. affinis* is associated with two other orchids, *Liparis liliifolia* and *Microstylis unifolia*. The flowering period of the former pretty well coincides with that of the Pogonia, as it was found in flower June 1, 1920, and by May 5, 1921. The flowering period of the Microstylis is slightly later and this plant is found also in pine woods on acid soils.

There is no possibility of confusing the two species of Pogonia and there are no intergrading forms, they are not even associated in the field. *P. verticillata* is the larger and more robust orchid, the plant has a reddish tinge and the leaves stand out approximately at right angles to the stem, they are also thicker. Further, the long purplish brown sepals of the Whorled Pogonia are very striking and distinctive.

It is certain that, time permitting a more continued search would have revealed many more plants of this rare orchid in the same area, as those observed all seemed well established and several bore last year's fruiting capsule on a dead shoot. So far no trace of the plant has been found in any other part of this region although the closely related *P. verticillata* is common here and widely distributed, but it does not occur in the *P. affinis* area. *P. verticillata* prefers soils that are medium acid to methyl red, and although it occurs on the borders of flat, dry, pine-oak woods, it does best on the lower edge of wooded slopes bordering the flood plains of streams, and in this habitat it is often associated with *Medeola virginiana*, the young plants of which might at first be mistaken for the orchid.

College of William and Mary, Williamsburg, Virginia.

SOME RARE PLANTS FROM KNOX COUNTY, MAINE.

C. A. E. Long.

In addition to the noteworthy Matinicus plants which I have previously listed in Rhodora, the following, collected during 1920, will be of interest.

Amelanchier canadensis (L.) Medic. This is the true *A. canadensis* according to Wiegand's treatment.[1] Common in New York and southward and southwestward, but very rare in Maine and eastern New England. It is frequent here on the island. I find it growing as a low irregular shrub along old stonewalls and on rocky hillsides, and in a more arborescent form where the soil is deeper and richer. Our other shadbushes are *A. oblongifolia* (T. & G.) Roem. and *A. laevis* Wiegand, as well as hybrids between the two.

Carex Oederi Retz. The typical form of the species. Rare in Maine. Quite abundant in one locality.

Juncus bufonius L., var. congestus Wahlb. Rare in Maine. Growing at sandy edge of seashore.

Polygonum Fowleri Robinson. A northern species, very rare in Maine. Gravelly beach.

Sagina nodosa (L.) Fenzl. The typical smooth form. Another northern plant, which reaches its s uthernmost known station here. Its previous southern limit was at Cutler, Maine.

Helianthus scaberrimus Ell. A western sunflower probably escaped from cultivation and long established in a waste corner.

Helianthus petiolaris Nutt. A few vigorous plants in an abandoned chicken-run. Probably introduced in so-called "scratch feed."

Tragopogon porrifolius L. Established for many years, and thoroughly naturalized in grassland.

On a few collecting trips in other parts of the county, notably Rockland and Rockport, I made some interesting collections. These towns contain many lime quarries, and while the soil may not be as fertile as in some other limestone districts of the state, there is an attractive flora, as the following list will show.

[1] Rhodora xiv. 150 (1921.)

CORONILLA VARIA L. A rare introduction, growing profusely by the side of the old road to Thomaston.

SALIX PURPUREA L. A rare willow in Maine. Established and prolifically spreading, at roadside in Rockport.

LEMNA TRISULCA L. In "Lily Pond" and brook running therefrom in Rockport. Second station in Maine. Formerly known from Houlton, where it was collected by Fernald and B. Long.

XYRIS MONTANA Ries. Found growing in "Meadow Bog," an extensive peat bog near Rockland. A northern species, very rare in Maine.

SCIRPUS CESPITOSUS L., var. CALLOSUS Bigelow. Another far northern plant growing abundantly in "Meadow Bog." This is a coastwise south-western extension of range from the Mount Desert region. The above named bog needs further exploration.

CAREX AUREA Nutt. Wet meadow near "Lily Pond," Rockport. Also abundant in another meadow in Rockland near lime quarries. Rare near the coast, indicating lime.

CAREX GRANULARIS Muhl., var. HALEANA (Olney) Porter. Shaded banks near "Lily Pond." Another calciphile which is rare near the coast.

CAREX TRICHOCARPA Muhl., var. ARISTATA (R. Br.) Bailey. Professor Fernald writes: "First east of western New York. A really startling find, for it is so conspicuous that if it occurs between the Knox Co. limestone region and western New York someone ought to have seen it." I find it plentiful on the banks of a brook flowing through a meadow, in a valley between two ranges of hills, in Rockland.

RUPPIA MARITIMA L., var. SUBCAPITATA Fernald & Wiegand. Near the railroad station at Damariscotta Mills in Lincoln Co., not far from Knox Co. Growing abundantly in a small brackish pond where the tide flows and ebbs. First station in Maine, but known both east and west. On the edges of the same pond there is a thick stand of *Typha angustifolia* L., a somewhat northern station for this cat-tail.

I am indebted to Prof. Fernald for verifying the determinations of the above named plants.

MATINICUS, MAINE.

Panicum virgatum var. cubense in Michigan.—In August of 1920, while engaged in field work for the Michigan Geological and Biological Survey in the Jack Pine Plains south of Burt Lake, Cheboygan County, Michigan, the writer found an interesting Panicum which was later identified as *Panicum virgatum* L. var. *cubense* Griseb. *Panicum virgatum* L. has been reported from several stations in Michigan; it is listed in Beal's Michigan Flora as infrequent. Var. *cubense* Griseb., however, has not, so far as the writer is aware, been reported from the state, nor from any inland station. According to Hitchcock and Chase (The North American Species of Panicum, Cont. Nat. Herb. vol. 15, p. 92) its range of distribution is the Atlantic Coastal Plain from Connecticut to Florida; also in the Bermudas and Cuba. It seemed so far out of range in northern Michigan that I submitted a specimen of the material to Professor A. S. Hitchcock, who verified my determination.

The plant was found in one locality only, namely in a depression where the sandy soil was considerably more moist than the soil typical of the Jack Pine Plains. In this locality it was fairly abundant and exhibited a vigorous growth.—J. H. Ehlers, University of Michigan.

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CIMICIFUGA RACEMOSA IN MASSACHUSETTS.

J. R. Churchill.

(Plate 132)

In October, 1919, I found in Sheffield, Berkshire County, Massachusetts, the withered stalk of a plant which I identified as *Cimicifuga racemosa* (L.) Nutt. It was in wild, steep rocky woods, across the river, and about two miles from the village. In the following year, on July 19, I came upon the plant about a mile from the first station growing scattered in beautiful open woods which sloped steeply down to a brook. It was then in full bloom, and the tall slender plants with the long spikes of white flowers lit up the sombre landscape and were very attractive. Ten days later I visited the first station, where I found the plants now growing vigorously and in great profusion. A photograph here reproduced illustrates the extent of the colony, the height of the plants and their environment. Both localities are quite remote from habitations and the plants appear to be indigenous.

Cimicifuga racemosa has rarely, if ever, been found in New England north of Connecticut, except in cultivation or as a garden escape. It is not in the Flora of Vermont (1915). In the Catalogue of Plants of Connecticut (1910) its occurrence is mentioned at "Norfolk, plentiful at one locality but probably introduced; at Oxford common; and frequent throughout the southwestern part of the state." The Sheffield stations are about five miles north of the Connecticut state line.

In the Gray Manual (1908) the range given is "s. N.E. to Wisc. and s.w., cultivated and escaped eastw." In his Report on the Herbaceous Plants of Massachusetts (1840) the Rev. Chester Dewey describes and mentions *Cimicifuga racemosa*, but only as "cultivated in the gardens of the Shakers."

It is natural that a plant so conspicuous and ornamental should be transplanted into gardens and thence in time again have run wild beyond its normal range. Two extralimital collections in the herbarium of the New England Botanical Club are probably of this class, viz: one by Parlin, Sept. 6, 1899, from "N. Berwick, Me.; growing in an orchard spreading from planted roots;" the other by John Murdoch, Jr., July 22, 1913, from "Bernardston, Mass., woods in E. part of town." A collection by R. Hoffmann from New Marlboro, Mass., a town adjoining Sheffield, and also on the Connecticut state line, may be indigenous, though found "persisting for years under a hedge-row." Bernardston, on the other hand, is in Franklin County, sixty miles northeast of Sheffield, on the Vermont line. Mr. Murdoch died in 1915, and his herbarium, with a duplicate plant and label, is now in the Field Museum of Natural History at Chicago.

In the catalogue of plants growing without cultivation in the vicinity of Amherst College, published by Prof. Edward Hitchcock in 1829, our plant is recorded, on his authority, from Goshen, Mass.; and this record is repeated as late as 1913 by Prof. George E. Stone of the Massachusetts Agricultural College at Amherst in his "List of Plants growing without cultivation in Franklin, Hampshire and Hampden Counties." Goshen is a small town in Hampshire County, southwest of Bernardston. Seeking to confirm so definite, though ancient a record as this I wrote to Prof. Alfred S. Goodale, who kindly reported to me that "a careful inspection of our plant collection at Amherst College fails to show a specimen from our vicinity. I have also examined what is left of Hitchcock's own collection and if it was originally there, it has disappeared from it." He adds, "I have not collected it myself in this region."

In the brief search which I have made, with results stated above, there is little to show the presence of the "Bugbane" or "Black Snakeroot" as a native of Massachusetts, except the stations at Sheffield. Possibly however, this note may be productive of infor-

mation of other collections, either in the field or from herbaria, with data which may verify not only its occurrence here but may determine its status as indigenous or as "cultivated and escaped eastward."

Dorchester, Massachusetts.

A CRITICAL REVISION OF HYDRANGEA ARBORESCENS.

Harold St. John.

Through the discriminating field observations of Mr. Charles C. Deam, the writer has had his attention directed to the conspicuously different plants that are now treated as *Hydrangea arborescens* L. The tendency of the present day authors is to withhold any recognition of these various forms. On the other hand, the writers of the early floras of eastern North America were familiar with some of them and gave them names. Rafinesque, for instance, made eight species out of the plant now considered to be *H. arborescens*. The others were more conservative. As was the case in a previous study of the variations of a polymorphic species,[1] a treatment very similar to that here presented is found in Torrey and Gray's Flora of North America. Within the species itself are recognized several subdivisions, which in most cases are clearly distinguishable by definite characters and by having different ranges, but they are shown to be of less than specific value by the existence of specimens having intermediate characters, and by the fact that their ranges overlap.

Linnaeus in founding *H. arborescens*[2] based it solely on HYDRANGEA. Anonymos floribus albis parvis, etc. of Gronovius.[3] This description was drawn from the Clayton specimen, no. 79, from Virginia. It is a low shrub with large cordate acuminate glabrous leaves. By using a hand lens it appears that the leaves of this shrub of the stream-banks of Virginia are essentially but not absolutely glabrous, for the principal nerves bear on the lower surface a short puberulence. This same character holds throughout the species and its varieties; in all cases the leaves are puberulent on the prin-

[1] *Lathyrus venosus* Muhl., see Butters and St. John, Rhodora xix. 156 (1917).
[2] Sp. Pl. i. 397 (1753).
[3] Fl. Virginica i. 50 (1739).

cipal nerves of the under surface. Just such a plant as that described by Linnaeus occurs from New York southward to Georgia and westward to Illinois, Missouri, and Oklahoma.

Another *Hydrangea* has flowers, fruit, and the pubescence of the leaves identical with those of *H. arborescens* L., but differs from it in having lance-ovate or lance-elliptic leaves that are oblique at base. This is exactly the plant separated as γ *oblonga* by Torrey and Gray.[1] Its range is somewhat more extensive than that of *H. arborescens*, reaching from New York southward to Georgia and Alabama and westward to Illinois, Missouri, Oklahoma, and Louisiana. In most cases this plant is strikingly different from *H. arborescens*, but there are frequent intermediate specimens. These show in some cases the lance-elliptic leaves oblique at base on the lower part of the plant, while the upper one or two pairs of leaves may be cordate-ovate exactly as in *H. arborescens*. In other cases the leaves of the entire plant are intermediate in shape between the two just described. In other cases the leaves show a pubescence on the lower surface on the secondary as well as the primary nerves. Because of the existence of these intermediate specimens it is felt that Torrey and Gray were quite right in maintaining the plant with narrow lance-elliptic leaves as a variety of the species. It should be known as *H. arborescens* L., var. *oblonga* T. & G.

Another variant of the species, though strikingly different from the others, has never received a name. It has often been collected, but it has always been identified either as *H. arborescens* L. or as *H. cinerea* Small.[2] Identical flowers and fruits clearly show that its true re-

[1] Fl. N. Am. i. 591 (1838–1840).

[2] By studying the original material the author has determined that *H. cinerea* Small is a mixture. Dr. Small cites five specimens in the original publication but does not indicate at this place that any particular one was designated as the type. One of these was of his own collection and on that sheet in the Columbia College Herbarium is written, "Type". This is a vigorous specimen with large cordate, acuminate leaves well coated on the lower surface with a dense gray short puberulence. This specimen represents exactly what is described here as *Hydrangea arborescens* L., var. *Deamii* St. John. The F. L. Scribner specimen from White Cliff Springs, Tennessee, has the same short crisp puberulence on the under surface of the leaves, but they differ in shape and size, being smaller and oblong-lanceolate. This is one of the specimens considered to be intermediate between var. *oblonga* T. & G. and var. *Deamii* St. John of *Hydrangea arborescens* L. In the original description of *H. cinerea* Small, the leaves are said to be "gray tomentose * * * beneath." Two of the cited specimens, both from the same region, Chilhowee Mountains and Chilhowee Gap, Tennessee, A. H. Curtiss, no. 833, and Kearney, June 24, 1893, have this gray tomentose pubescence. It is exactly like the heavy coat of fine white tomentose

lationship is with *H. arborescens* L. It also has the large cordate-ovate acuminate leaves of that species, but they are more coriaceous and are densely puberulent beneath owing to the fact that all of the nerves, even the smallest secondary ones, bear puberulence. This variant is not found in the northern Appalachians, occurring only from Ohio to Illinois and southward to Oklahoma, Tennessee, and Georgia. As in the previous case there are intermediate specimens. Such a one as that from Kennesaw Mt., Georgia, May 16, 1885, R. N. Larrabee has the leaf form of var. *oblonga* but the pubescence of the more western pubescent plant. Then there are plants with the pubescence so sparse on the secondary nerves, that it becomes a matter of fine judgment whether or not the plant should be considered *H. arborescens* L., or the pubescent plant under discussion. Again, this plant seems to be properly treated as a variety of *H. arborescens* L. Mr. Charles C. Deam, who has recently collected this variety in Indiana, has noticed that it differed from the essentially glabrous *H. arborescens* L., and has called my attention to it. Consequently I take pleasure in dedicating this new variety to him.

There is a sterile or radiant form of each one of these three plants, although they have been found but a few times in the wild state. Their rarity is well brought out by a note on a specimen of *H. arborescens* L., var. *oblonga* T. & G. in the Gray Herbarium collected at Bedford, Virginia, June 25, 1871, by A. H. Curtiss. He writes, "I have for seven years in N. & S. Va. searched for radiant flowers on this sp[ecies] but never till this year found them & these on a single bush. So I conclude they are of very rare occurrence." This specimen has only a few of its marginal flowers radiant and would not in the present classification be considered as of the radiant form, which has all of its flowers sterile and radiant. In classifying these showy forms it is necessary to give one new name and to make one new combination.

pubescence characteristic of *H. radiata* Walt., except for the color. A careful examination of these two sheets shows that the leaves seen from above have the great blotches of brownish or blackish color which are characteristic of poorly dried specimens or those dried under unfavorable conditions. Also both specimens have been poisoned with a solution of corrosive sublimate as is shown by the yellowish stains on the sheets. Consequently, it seems evident to the writer that the gray color of the pubescence is due to the poor drying and the poisoning and that these two specimens are without question *H. radiata* Walt. The remaining one, Scribner, July, 1894, of the five specimens on which *H. cinerea* Small was based has not been seen by the author.

In the course of this study the author has used the collections of the Gray Herbarium, the Arnold Arboretum, Columbia College Herbarium, the Herbarium of the New York Botanical Garden, the California Academy of Sciences, and the private herbaria of Mr. C. C. Deam, Mr. Walter Deane, and Mr. F. W. Hunnewell. To Dr. B. L. Robinson, Dr. J. K. Small, Mr. C. C. Deam, and Mr. J. C. Nelson, he is indebted for extended loans of specimens or books. Specimens are cited from each state where they have been collected, but in most cases only one from each state is listed.

The following notation is used to indicate the location of a cited specimen:

(C) = Columbia College Herbarium
(Cal) = California Academy of Sciences
(D) = Herbarium of Mr. C. C. Deam
(G) = Gray Herbarium of Harvard University
(N) = Herbarium of the New York Botanical Garden

KEY TO HYDRANGEA ARBORESCENS AND ITS VARIATIONS.

A. Leaves nearly glabrous beneath, the scanty puberulence confined to the principal nerves.
  B. Leaves cordate or rounded at base, broadly ovate or suborbicular with an acuminate tip.
    C. Some or all of the flowers fertile.....1. *H. arborescens* L.
    C′. All of the flowers sterile and radiant.....2. f. *grandiflora* Rehder.
  B′. Leaves oblique at base, lance-ovate or lance-elliptic.
    D. Some or all of the flowers fertile.....3. var. *oblonga* T. & G.
    D′. All of the flowers sterile and radiant...4. f. *sterilis* (T. & G.) St. John
A′. Leaves closely short-puberulent beneath, all of the secondary nerves bearing hairs, cordate or rounded at base, broadly ovate or suborbicular, acuminate at tip.
  E. Some or all of the flowers fertile.....5. var. *Deamii* St John
  E′. Most all of the flowers sterile and radiant.....6. f. *acarpa* St. John

1. HYDRANGEA ARBORESCENS L., Sp. Pl. i. 397 (1753); *H. vulgaris* Michx., Fl. Bor.-Am. i. 268 (1803); *H. cordata* Pursh, Fl. Am. Sept. i. 309 (1816); *H. vulgaris* Michx., β *cordata* (Pursh) Torr., Ann. Lyc. N. Y. ii. 205 (1827); *H. arborescens* L., var. *vulgaris* (Michx.) Ser., DC. Prodr. iv. 14 (1830); *H. arborescens* L., β *cordata* (Pursh) T. & G., Fl. N. Am. i. 591 (1838–1840); *H. arborescens* L., f. *typica* Schneider, Ill. Handb. d. Laubholzk. i. 387 (1905); *H. arborescens* L., f. *vulgaris* (Michx.) Schneider, l. c. 387; *H. arborescens* L., var. *typica* Schneider, Ill. Handb. d. Laubholzk. ii. 943 (1912).

DISTRIBUTION: NEW YORK: Wellsburg Narrows, Chemung Co., July 2, 1896, September 17, 1897, *T. F. Lucy*, no. 5,490 (N). PENNSYLVANIA: Nescopec, Luzerne Co., July 2, 1889, *A. A. Heller* (G.).

District of Columbia: in silvis frequens prope Washington, July 15, 1888, *Th. Holm* (Cal). West Virginia: Banks of Blackwater River, Hendricks, Tucker Co., *J. M. Greenman*, no. 213 (G). North Carolina: Blowing Rock, August 9, 1893, *B. L. Robinson*, no. 134 (G). Georgia: ravines, Madison Springs, September, *H. W. R*[*avenel*] (G). Indiana: rocky wooded ravine just west of Aurora, *C. C. Deam*, no. 6,842 (D). Kentucky: Big Black Mountains, Harlan Co., *T. H. Kearney, Jr.*, no. 154 (G). Tennessee: bluffs along Tennessee River, Knoxville, *A. Ruth*, no. 336 (G). Alabama: riverbank, Montgomery, June 1, 1897, *C. F. Baker* (N). Illinois: shady rocks, St. Clair Co., June 29, 1877, *H. Eggert* (G). Missouri: along bluffs, Noel, *B. F. Bush*, no. 4,987 (G). Oklahoma: in ravine, north side Rich Mt., near Page, Leflore Co., *G. W. Stevens*, no. 2,749 (G).

2. H. arborescens L., f. grandiflora Rehder, Mitt. Deutsche Dendrolog. Gesell. 71 (1907).

Distribution: Found wild in Ohio and introduced into cultivation. Ohio: specimen from this source cultivated at the Arnold Arboretum, June, 1907, *Alfred Rehder* (G). Tennessee: Nashville, *Wilkinson* (G).

3. H. arborescens L., var. oblonga T. & G., Fl. N. Am. i. 591 (1838–1840); *H. cinerea* Small, Bull. Torrey Bot. Club xxv. 148 (1898), in part; *H. arborescens* L., f. *oblonga* (T. & G.) Schneider, Ill. Handb. d. Laubholzk. i. 387 (1905).

Distribution: New York: near Painted Post, Steuben Co., July 24, 1884, *Miss I. S. Arnold* (G). New Jersey: rocky woods, Phillipsburg, August 15, 1909, *K. K. Mackenzie*, no. 4,281 (D). Pennsylvania: near Smithville, Lancaster Co., *Heller* & *Halbach*, no. 541 (G). District of Columbia: Herb. *A. Gray* (Type G). West Virginia: rocky woods, White Sulphur Springs, Greenbrier Co., *K. K. Mackenzie*, no. 412 (D). Virginia: on Round Top Mountain, west of Seven Mile Ford, Smyth Co., July 2, 1892, *J. K. Small* (G). North Carolina: rich shady woods, Biltmore, June 21, & September 28, 1897, *Biltmore Herbarium*, no. 1,339 b (G). Georgia: rich shady woods, Athens, June 25, 1900, *R. M. Harper*, no. 35 (G. & N.). Indiana: on a wooded hillside about three miles west of New Albany, Floyd Co., *C. C. Deam*, no. 9,374 (D). Alabama: Greensboro, 1857, *S. Watson* (G). Kentucky: Kuttawa, Lyon Co., June 2–18, 1909, *W. W. Eggleston*, no. 4,756 (N). Tennessee: rich woods, Knoxville, *A. Ruth*, no. 2,025 (N). Alabama: Auburn, Lee Co., August 2, 1897, *Earle* & *Baker* (N). Mississippi: Waynesboro, Wayne Co., *C. L. Pollard*, no. 1,244 (G). Illinois: rocky banks, Athens, Menard Co., 1861, *E. Hall* (G). Missouri: Meramec Heights, *E. E. Sherff*, no. 69 (G). Arkansas: Benton

Co., 1899, *E. N. Plank* (N). LOUISIANA: deciduous woodland, Baines, West Felicia Parish, August 23, 1912, *F. W. Pennell* (N). OKLAHOMA: at edge of thicket, near Mannsville, Johnston Co., *Florence Griffith*, distributed by *G. W. Stevens*, no. 3,447 (G).

4. H. ARBORESCENS L., var. OBLONGA T. & G., f. **sterilis** (T. & G.) comb. nov., *H. arborescens* L., δ *sterilis* T. & G., Fl. N. Am. i. 591 (1838–1840); not *H. arborescens* L., var. *oblonga* T. & G., f. *sterilis* (Rehd.) Schneider, Ill. Handb. d. Laubholzk. ii. 943 (1912). Torrey & Gray's var. *sterilis* differs from the var. *oblonga* only in having the "flowers all sterile and radiate." It is then better treated as a form under that variety than as of equal rank. Although the original collection was made before 1840, no subsequent ones have been seen.

DISTRIBUTION: PENNSYLVANIA: Wysox, *J. Carey* (TYPE in G).

5. H. ARBORESCENS L., var. **Deamii** var. nov., *H. vulgaris* Nutt., Gen. N. Am. Pl. i. 284 (1818), not Michx.; *H. cinerea* Small, Bull. Torrey Bot. Club xxv. 148 (1898), as to type specimen, not as to description and cotypes; *H. cinerea* Gray's Man. ed. 7, 450 (1908), in part, ab forma typica differt foliis grandis cordato-ovatis acuminatis coriaceis, subtus valde puberulentis, nervis primariis secundariisque etiam locis inter nervos pilos ferentibus.

Differing from *H. arborescens* L., in having its large cordate-ovate acuminate leaves more coriaceous and with the under surface clothed with a dense puberulence borne from the primary and secondary veins and even from the spaces between veins.

DISTRIBUTION: GEORGIA: rich shady woods, Whitfield Co., *R. M. Harper*, no. 243 (G). OHIO: Cincinnati, *R. Buchanan*, no. 832 (N). INDIANA: on an exposed place of the rocky slope of White River, one mile east of Sparksville, Jackson Co., July 15, 1919, *Charles C. Deam*, no. 28,122 (TYPE in G). TENNESSEE: rocky hillsides, altitude 2,300 feet, Lookout Mountain, July 1903, *H. A. Gleason* (G). ILLINOIS: shaded bluff, Homer, Champaign Co., A. S. *Pease*, no. 13,028. MISSOURI: limestone bluffs, Neosho, *E. J. Palmer*, no. 3,999 (G). ARKANSAS: Benton Co., 1899, *E. N. Plank* (N). OKLAHOMA: along streams, Page, Leflore Co., *E. J. Palmer*, no. 12,640 (Cal).

6. H. ARBORESCENS L., var. DEAMII St. John, f. **acarpa** forma nova, praecedenti similis sed differt floribus omnibus infertilibus radiatisque.

Differs from *H. arborescens* L., var. *Deamii* St. John by having all of its flowers sterile and radiant.

DISTRIBUTION: MISSOURI: woods, Monteer, August 6, 1910, *B. F. Bush*, no. 6,116 (TYPE in G).

STATE COLLEGE OF WASHINGTON, PULLMAN, WASH.

THIRD REPORT OF THE COMMITTEE ON FLORAL AREAS.

The present report, covering all the families of the Fern Allies except *Isoetaceae* follows the lines of its two predecessors,[1] giving a check list of the New England species and a geographic grouping of them according to their ranges within our area. In the check-list are included all varieties recognized in Gray's Manual and nearly all proposed in subsequent revisions; some of these, which appear to be mere forms without distinctive or significant ranges are, however, omitted in the geographic treatment. The nomenclature is that of the Manual somewhat modified by the studies mentioned. The principal changes are: the restoration of the old sixth edition name *Equisetum limosum* in place of *E. fluviatile*, a change which proves to be required by the International Rules[2]; and the substitution of *Botrychium dissectum* for *B. obliquum*, the former being the earliest name in the group.[3] One of the Manual varieties calls for a new combination under *B. dissectum:* in making the transfer, this variety is here reduced to a form, since that appears to be its correct taxonomic status.[4]

PRELIMINARY LISTS OF NEW ENGLAND PLANTS—XXVIII.

[The sign + indicates that an herbarium specimen has been seen; the sign — that a reliable printed record has been found.]

Ophioglossaceae	Me.	N. H.	Vt.	Mass.	R. I.	Conn.
Botrychium angustisegmentum (Pease & Moore) Fernald .	+	+	+	+	+	+
" dissectum Spreng. . .	+	+	+	+	+	+
" " f. elongatum (Gilbert & Haberer) Weatherby	+			+		—

[1] Rhodora xx. 181–185; 193–197 (Oct., Nov., 1918): xxii. 80–89 (May, 1920).

[2] Rhodora xxiii. 43–47 (Apr., 1921).

[3] See Clute, Fern Bull. x. 76 (1902).

[4] Botrychium dissectum Spreng., f. **elongatum** (Gilbert & Haberer) Weatherby, n. comb. *B. obliquum elongatum* Gilbert & Haberer, Fern Bull. xi. 89 (July, 1903).

	Me.	N. H.	Vt.	Mass.	R. I.	Conn.
OPHIOGLOSSACEAE						
Botrychium dissectum Spreng.	+	+	+	+	+	+
" " f. obliquum (Muhl.) Fernald . .	+	+	—	+		
" " f. oneidense (Gilbert) Clute . .	+		+			
" Lunaria (L.) Sw. . .	+	+	+	+	+	+
" ramosum (Roth) Aschers.	+	+	+	+	+	+
" simplex E. Hitchcock .	+	+	+	+	+	+
" " var. compositum (Lasch) Milde	+	+	+			
" ternatum (Thunb.) Sw.						
" var. intermedium D. C. Eaton .	+	+	+	+		+
" " var. rutaefolium (A. Br.) D. C. Eaton	+	+	—			
" virginianum (L.) Sw. .	+	+	+	+	+	+
" " var. europaeum Angström	+	+	+			
" " var. intermedium Butters	+		+	+		+
" " var. laurentianum Butters	+					
Ophioglossum vulgatum L. . . .	+	+	+	+	+	+
" " var. minus Moore . .		—				
MARSILEACEAE						
Marsilea quadrifolia L.	+			+		+
SALVINIACEAE						
Azolla caroliniana Willd. . . .				+		

EQUISETACEAE	Me.	N. H.	Vt.	Mass.	R. I.	Conn.
Equisetum arvense L.	+	+	+	+	+	+
" hyemale L., var. affine (Engelm.) A. A. Eaton	+	+	+	+	+	+
Equisetum hyemale L., var. intermedium A. A. Eaton			+			+
" limosum L.	+	+	+	+	+	+
" litorale Kühlewein	+	+	+	+		
" palustre L.	+	+	+			+
" pratense Ehrh.	+	+	+	+		+
" scirpoides Michx.	+	+	+	+		+
" sylvaticum L., var. pauciramosum Milde.	+	+	+	+		+
" " pauciramosum f. multiramosum Fernald	+	+	+	+	+	+
" variegatum Schleich.	+	+	+	+		+
" " var. Jesupi A. A. Eaton	+		+			+
LYCOPODIACEAE						
Lycopodium annotinum L.	+	+	+	+		+
" " var. acrifolium Fernald	+	+	+	+		+
" " var. alpestre Hartm.		+				
" " var. pungens Desv.	+	+	+			
" clavatum L.	+	+	+	+	—	+
" " var. megastachyon Fernald & Bissell	+	+	+	+	+	+
" " var. monostachyon Grev. & Hook.		+				
" complanatum L.	+	+	+			
" " var. flabelliforme Fernald	+	+	+	+	+	+

	Me.	N. H.	Vt.	Mass.	R. I.	Conn.
LYCOPODIACEAE						
Lycopodium complanatum L. . .						
" " var. Wibbei Haberer .			+			
" inundatum L. . . .	+	+	+	+	+	+
" " var. alopecuroides (L.) Tuckerm.				+		
" " var. Bigelovii Tuckerm.				+	+	+
Lycopodium lucidulum Michx. . .	+	+	+	+	+	+
" " var. porophilum (Lloyd & Underw.) Clute. .	+		—			
" obscurum L.	+	+	+	+	+	+
" " var. dendroideum (Michx.) D. C. Eaton.	+	+	+	+	+	+
" sabinaefolium Willd. .	+	+	+			
" Selago L.	+	+	+	+		+
" " var. appressum Desv. . .	+	+	+			
" " var. patens (Beauv.) Desv.			+			
" sitchense Rupr. . .	+	+	—			
" tristachyum Pursh .	+	+	+	+		+
SELAGINELLACEAE						
Selaginella apoda (L.) Fernald . .	—	+	+	+	+	+
" rupestris (L.) Spring	+	+	+	+	+	+
" selaginoides (L.) Link	+					

Two of the above species, *Marsilea quadrifolia* and *Azolla caroliniana*, are, the latter certainly and the former in all probability, introduced. The Azolla seems to have been first collected in a pond in Forest Park, Springfield, Mass., in 1892, by Mrs. M. L. Owen and in 1896 was reported as spreading. From information kindly furnished us by Dr. W. H. Chapin, it now appears to be extinct. There is no other New England locality for it on record.

Marsilea quadrifolia was first reported in the addenda to the fourth edition of Gray's Manual in 1863 from Bantam Lake, Litchfield, Conn., where it had been collected by Dr. T. F. Allen, and was long supposed to be native there. It does not appear, however, in J. P. Brace's comprehensive list of plants of Litchfield and vicinity published in 1822: very probably, as is surmised in the 7th edition of the Manual, it was "casually introduced" at some time between these two dates. Another Connecticut station, at Cromwell, is known to have existed for at least 45 years. The plant is easily established in still, shallow water and has been introduced at Maranacook and Skowhegan, Maine; Boxford, Billerica, Concord, Salem, Malden, Cambridge, Jamaica Plain, West Roxbury, Needham and Dedham in eastern Massachusetts; and, besides the two stations above mentioned, at New Haven and Middlebury, Conn.

The arrangement of the native species given below follows in general that of our last report: readers are referred to that report for definitions and explanation of groups there adopted. We have recognized here four new groups, for the reasons given under them and from the belief that better results can be obtained by creating categories as numerous as may be required to bring like ranges together than by attempting to crowd all our plants, almost endlessly various in their distribution as they are, into a few generalized divisions. Where possible, we have used, as titles for the groups, condensed statements of the ranges concerned and in so doing have employed more definitely than hitherto the Cape Cod region[5] and the upper St. John valley in northern Aroostook Co., Maine,[6] as, in some sort, index areas. These two regions—the former mainly of sandy, acid soils without rock outcrops and of oak and pitch pine barrens, the latter with heavy, often calcareous soils, river cliffs and wide stretches of Canadian forest; one with the mildest climate in New England, the other with one of the most severe—are well-nigh complete antitheses of each other. One offers the extreme of austral conditions, the other, (except for the very limited alpine areas on

[5] Comprising southeastern Plymouth County and all of Barnstable, Dukes, and Nantucket Counties. This region is not homogeneous, as the occurrence in certain localities within it of such woodland types as *Botrychium ramosum* and *Lycopodium lucidulum* testifies; but these boundaries seem sufficiently accurate for our present purpose. The region is referred to, for brevity, as Cape Cod.

[6] Comprising that part of Aroostook County north and west of the Aroostook Valley. Referred to as the upper St. John.

our mountain-tops) the extreme of boreal conditions within our territory. Species found in both may be expected to occur generally in New England elsewhere: and so much collecting has been done in both that the absence of any record of a given species from either may be accepted with little or no doubt as representing the facts.

It is to be understood that species which are alike in being found throughout a given area may differ considerably in the frequency of their occurrence. The groups here defined are, of course, likely to require revision with increase of our knowledge. The committee will be grateful for any data which modify the ranges as stated.

I. GENERALLY DISTRIBUTED.

Botrychium ramosum
" virginianum
Equisetum arvense
" limosum
Lycopodium complanatum, var. flabelliforme
Lycopodium lucidulum
" obscurum
" "
var. dendroideum
Lycopodium tristachyum

Although, at the present stage of our work, it is impossible to classify these species otherwise than as generally distributed and though they occur in all, or very nearly all, parts of New England, they differ somewhat in the details of their distribution. Only *Equisetum arvense*, *Lycopodium obscurum* and its var. *dendroideum* seem to occur quite evenly throughout. *Botrychium ramosum*, *Lycopodium complanatum*, var *flabelliforme* and *L. tristachyum*, though found in the Ft. Kent-Van Buren region, apparently become noticeably less common in northern Maine and were not observed by St. John and Nichols on their journey from Moosehead Lake to St. Francis via the upper reaches of the St. John River. *Botrychium virginianum*, though known from extreme southeastern Maine at Pembroke, conspicuously avoids the vicinity of the coast between that point and the Kennebec valley. *Lycopodium tristachyum* has, curiously, not been reported from Rhode Island though occurring on all sides of that state. It seems altogether probable that it will eventually be found there. The two Botrychiums, *Equisetum limosum*, and *Lycopodium lucidulum* are very rare in the Cape Cod region; thereby, their ranges form a transition to the following group.

II. Generally distributed, except in Cape Cod.

Equisetum sylvaticum,
var. pauciramosum[7] Lycopodium clavatum
Lycopodium clavatum, var. megastachyon

Species with this range (e. g., *Cystopteris fragilis*) occurred in the families previously reported upon, but were then included among the generally distributed species. It now seems to us, however, desirable to segregate them, since the absence of any plant from Cape Cod is likely to be significant of its preferences as to soil and habitat conditions.

The species here included are inhabitants of moist or dry woodlands or rarely meadows, in comparatively rich soils. Their absence from Cape Cod is doubtless due to lack of suitable habitats there.

III. Neither the upper St. John nor Cape Cod; rather general elsewhere.

Botrychium simplex Botrychium ternatum,
var. intermedium
Equisetum hyemale, var. affine

This group corresponds closely to the "Rich Soils" group of the last report. *Botrychium simplex* is not known to us from any point in Maine north of about the 45th parallel of latitude, except for a single outlying station at Bridgewater (Kate Furbish). *B. ternatum*, var. *intermedium* reaches slightly further north in central Maine and has similar outlying stations at Mars Hill and Limestone. These isolated occurrences are probably to be accounted for by the existence in eastern Aroostook County of a large area characterized by a hardwood forest of a distinctly southern type.[8] *Equisetum*

[7] Including, for our purposes, f. *multiramosum*. The stations for typical var. *pauciramosum* are all within the range of group III; but they are few and scattered and we doubt if their distribution indicates anything but accidents of collection.

[8] See Goodale in 6th Rep. Maine Board of Agric. 370ff. (1861). Prof. Goodale was struck by the contrast between the vegetation of this area and that of the upper St. John, from which he had just come. He had no opportunity to ascertain its extent. Prof. Fernald, to whom we are indebted for the reference to Goodale's work, informs us that it runs from the Aroostook Valley on the north to that of the Mattawamkeag on the south, and west to about the 69th parallel of longitude. On the southwest a narrow arm connects it with the hardwood forest area of central Maine, forming an avenue of emigration for woodland species.

hyemale, var. *affine*, which prefers loose soils, especially on terraces and banks near streams, has about the same northern limit as *B. simplex*, but without the outlying station: though it occurs at Pembroke in Washington Co., it has not been found near the coast between that point and Wells.

IV. Northern.

A

Equisetum scirpoides
Lycopodium annotinum
Lycopodium annotinum, var. acrifolium

B

Botrychium ternatum, var. rutaefolium	Lycopodium clavatum, var. monostachyon
Botrychium virginianum, var. europaeum	Lycopodium complanatum
Botrychium virginianum, var. laurentianum	Lycopodium sabinaefolium
Lycopodium annotinum, var. alpestre	Lycopodium Selago
Lycopodium annotinum, var. pungens	" " var. patens

Lycopodium sitchense

This group corresponds exactly with that of the same name in our last report. Of the species in sub-division A, *Equisetum scirpoides* reaches its southern limits at Southbridge, Mass., and in northwestern Connecticut. The two Lycopodiums reach Cape Ann, the central highland of Massachusetts and western Connecticut; *L. annotinum* var. *acrifolium* is found also at Union, in the eastern highland of Connecticut. It seems to be much less common in Maine than typical *L. annotinum*, and is not recorded by St. John and Nichols.

Of sub-division B, *Lycopodium annotinum*, var. *alpestre* is known in our area only from Mt. Lafayette, *L. clavatum*, var. *monostachyon* only from Mt. Washington and *L. Selago*, var. *patens* only from Mt. Mansfield. Typical *L. Selago*[9] is chiefly confined to mountainous

[9] Including var. *appressum*.

regions, occurring on Mt. Katahdin, the Bigelow Range, and Sargent Mt. on Mt. Desert Island in Maine, the White Mountain region and Mt. Monadnock in New Hampshire, Mt. Mansfield in Vermont and Mt. Greylock in Massachusetts. But it occurs also at lower altitudes at East Dover, N. H., and Johnson, Vt., has a station at Mt. Holyoke in Massachusetts and descends nearly to sea level at Deer Isle, Me., and on trap ridges near New Haven, Conn. The other species and varieties are all, apparently, rather rare, occurring at comparatively few and scattered stations in the three northern states. Only *Lycopodium annotinum*, var. *pungens* reaches the vicinity of the sea, at Lubec, Cutler and Wass Island on the cold eastern coast of Maine: only *L. complanatum* and *L. sabinaefolium*, which are both found at Hartland, Vt., extend further south than the White Mountain region.

V. Cape Cod and rather general elsewhere, but not the upper St. John.

Botrychium angustisegmentum
Botrychium dissectum
Botrychium dissectum, f. obliquum
Ophioglossum vulgatum[10]
Lycopodium inundatum

This group corresponds essentially to the Southern A of the last report. *Botrychium angustisegmentum* and *B. dissectum*, like their congeners in group III, have outlying stations at Bridgewater, in the deciduous woods region of northeastern Maine. The former is not known from the Maine coast east of Boothbay. The four Ophioglossaceae are all plants of comparatively southern range, having their northeastern limits in New England or the Maritime Provinces. *Lycopodium inundatum*, on the other hand, is of wide distribution in northern latitudes in America and Eurasia, reaching, in the eastern United States, no further south than Pennsylvania. In any analysis of the geographic elements of the New England flora based on general ranges it would have to be placed in a different group from the other species here included; but within New England its occurrences correspond in general with theirs, except for two stations on the

[10] Including var. *minus*, which appears to be only a starved and depauperate state growing in sand. See Stone, Plants of Southern N. J. 122 (1911).

upper course of the St. John River, just north of the Aroostook County line (St. John and Nichols). Its distribution may perhaps be accounted for by the fact that it is a plant of acid soils, in southern New England at least particularly partial to damp sand, and that such habitats are largely lacking in northern Maine. Conversely, it is, unlike most plants of northern range, common on Cape Cod, where such habitats are to be found in abundance.

VI. Chiefly the three southern States

Selaginella apoda

This is the Southern B of the last report. *S. apoda* is not reported from Cape Cod, where suitable habitats for this plant of moist, grassy places are lacking It reaches its northern limits at Newfane, Vt., Hanover and Manchester, N. H., and Berwick, Me.

VII. Coastal Plain

Lycopodium inundatum, var. alopecuroides
" " " Bigelovii

The former is a plant of the Piedmont and coastal plain southward, occurring in our region only on Nantucket. The latter, like the coastal plain species of the last report, penetrates further inland. It is, however, certainly known to us no farther from the coast than Woodstock, Conn., and Groton, Mass., and no farther north than Plum Island, Mass. It has been reported from Sunderland, Vt., and Mt. Desert Island, Me. The Mt. Desert plant and also specimens from Cumberland, Me., distributed as var. *Bigelovii*, appear to us no more than, at most, transitional forms. We have seen no specimens from the Vermont locality; it seems probable, however, that this report is based either on a misidentification or on the misapplication of Tuckerman's name made by Lloyd and Underwood.[11]

VIII. Calciphile Species.

Botrychium Lunaria
Equisetum variegatum
Equisetum variegatum, var. Jesupi
Selaginella selaginoides

Botrychium Lunaria and *Selaginella selaginoides* are among our

[11] See Rhodora xxiii. 100 (1921).

rarest species. The latter is known only from Ft. Kent (A. A. Eaton) and from near the confluence of the St. John and Big Black Rivers (St. John and Nichols), the former from Ft. Kent (J. R. Churchill) and, in Vermont, Willoughby (C. H. Tilton) and St. Johnsbury Miss Inez Howe). *Equisetum variegatum* and its variety *Jesupi* occur at scattered stations in the larger calcareous areas of New England south to western Connecticut. It is a curious fact that, though their general ranges are the same, they have apparently never been collected at the same place nor nearer than 20 miles to each other.

IX. River-valley

Equisetum litorale Equisetum palustre
Equisetum pratense

These three species show a discontinuous range, not matched in any group heretofore distinguished. They are chiefly, though not entirely, confined to the valleys of the larger rivers and to the Champlain Valley—a distribution perhaps due to a preference for alluvial soils, to which, however, they are by no means restricted. *E. litorale* is known from the St. John, Penobscot, Kennebec and Androscoggin valleys in Maine; on the lower Merrimac; along the shores of Lake Champlain; and on the Connecticut at Stewartstown, Lebanon and Walpole, N. H., and Westminster, Vt. *E. palustre* occurs in the same valleys, except that of the Penobscot, extending south along the Connecticut to East Windsor and Lyme, Conn., and is found besides at Brandon, Willoughby Lake and near Lake Memphremagog in Vermont. *E. pratense* has a somewhat more irregular distribution. It is known only from the St. John, Kennebec, Connecticut and Housatonic valleys, and from Newark and Brandon, Vt.

X. Western New England only.

Equisetum hyemale, var. intermedium

This is referable to a small group to which *Trollius laxus* and *Hydrastis canadensis* of our first report belong. They are species of more or less wide range in the central United States, touching our area only along its western border and but rarely there. They penetrate eastward no further than the central lowland of Connecticut.

Equisetum hyemale, var. *intermedium* is known from Hartford, Suffield, Oxford and Norfolk in Connecticut and Pownal and Burlington, Vt.

XI. Miscellaneous.

Botrychium virginianum, var. intermedium

Lycopodium lucidulum, var. porophilum

Selaginella rupestris

Selaginella rupestris, the most widely distributed of these plants in New England, has a puzzling range It is a species of dry ledges, of Alleghanian range outside of New England. With us, it has two stations in extreme northern Maine; but it is almost entirely absent from the White Mt. region, occurring only on the extreme fringes of the mountains at Moultonboro and Berlin, and apparently from northeastern Vermont. In Maine, its stations, except for the two mentioned, are all either near the coast or in the valleys of the Androscoggin and Penobscot Rivers. It is fairly general southward, except on Cape Cod where it is not known—a circumstance readily accounted for by the absence of rock outcrops there. Recent taxonomic study of the group to which *S. rupestris* belongs has segregated a number of southern and western species formerly referred to it. The northeastern members of the group have not yet been critically studied; possibly we have to reckon with more than one species here.

Botrychium virginianum, var. *intermedium* is known from four stations, one each in Maine, Vermont, Massachusetts and Connecticut. More data in regard to it are needed. Similarly the New England stations for *Lycopodium lucidulum*, var. *porophilum* (northern Maine and Clarendon, Vt.) are too few to give any sure indication of the group to which it belongs.

C. H. Knowlton
W. S. Ripley, Jr.
C. A. Weatherby

The date of the August issue (unpublished as this goes to press,) will be announced later.

CIMICIFUGA INDIGENOUS AT SHEFFIELD, MASSACHUSETTS.

Rhodora

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A STATION FOR CROTON GLANDULOSUS IN NEW JERSEY.

Bayard Long.

Some years ago, during an examination of the private herbarium of Mr. W. H. Roper of Atco, New Jersey, I came unexpectedly upon local material of *Croton glandulosus* L.[1] Mr. Roper was quite familiar with the plant and informed me that it occurred along the railroad above Bishops Bridge—a flag-stop near Atco. This spot is along the steam line of the Pennsylvania Railroad to Atlantic City, about twenty miles out of Camden.

Croton glandulosus is a tropical American species of sandy soils, extending northward in the Mississippi valley to Iowa and through the southeastern states to Virginia. In the northeastern United States it is best known historically, as one of the ballast-ground plants formerly found about certain of the Atlantic seaports. In Aubrey H. Smith's paper on "On Colonies of Plants Observed near Philadelphia,"[2] published in 1867, it is reported to have occurred below the Navy Yard from 1864 to 1866, being "more abundant in the last of these years"—which is amply borne out by numerous specimens dated 1866 contained in various herbaria. There are collections from Kaighn's Point, Camden, New Jersey, opposite Philadelphia, made in the same year, as well as in 1865. It was obtained in 1866 at Newcastle, Delaware, not very far below Philadelphia. A single plant only, however, was noted, according to the label-data with the extant material in the Commons Herbarium, and there is no evidence that the species occurred there subsequently.

[1] The northern, widely distributed phase of this very variable species known as *C. glandulosus* var. *septentrionalis* Muell. Arg.

[2] Smith, Proc. Acad. Nat. Sci. Phila. xix. 22 (1867).

The last collection appears to have been in 1879 from the ballast-grounds at Philadelphia. It is not possible to say whether the plants collected in the later years of this period were descendants of the first colonists, but it seems unlikely. Comparatively few of these ballast plants persisted, and collections of a species over a lengthy period frequently seem to represent repeated cases of colonization. There were periods of renewed interest in the ballast-grounds during more recent years, particularly in the late 90's, but the species was not found at this time.

Mr. Roper's collection near Bishops Bridge show that it occurred there as early as 1913. Because of my interest expressed in the plant he visited the station again in 1918 and reported it in some abundance, fruiting copiously, and evidently increasing. When, on October 5 of the past year, my long deferred visit was made, I was amply repaid by the sight of many hundreds of vigorous plants.

The railroad at this spot extends across a low depression and has been laid upon a stone-and-cinder fill. On the long, sloping railroad bank the croton has found a favorable habitat, with numerous other weeds that like loose cinder railroad-ballast. For more than a hundred feet along this slope the croton is the most conspicuous, if not the dominant species. At the foot of the slope, among the weeds of ranker growth and the native vegetation encroaching from the low ground, the plants were tall and slender, some approaching two feet in height; while at the crest of the bank those growing in the dry, sun-baked cinders, having had little growth-competition, were stout little "bushes" about a foot tall. At the time of my visit the somewhat shaded plants were still fresh and green; those in the open were in greater maturity and made really very handsome foliage-plants with their drooping, primary leaves turning a rich salmon color. All were fruiting profusely and apparently prepared to continue flowering and fruiting indefinitely. Probably only killing frosts terminate its growing season in this latitude. The railroad company's scythe that makes periodical raids upon the vegetation along the tracks seems not to have discouraged the plant. Those individuals that were cut down appeared to have suffered only a judicious pruning, resultant in a greater branching and increased fruiting.

The presence of considerable paper and rubbish along the railroad bank suggests that car-sweepings may be dropped here. This is

undoubtedly a fertile source of introduction of many railroad weeds. And possibly this colony of *Croton glandulosus* may have originated in such manner.

Although the plant was not detected at any other station along the railroad, the vigorous manner in which the species is establishing itself at this spot leaves no doubt in the mind that it is only a question of time when it will have extended further along the railroad, or even out into the adjacent sand-barrens.

It is said to be a weed in portions of its range, and like many crotons and allied species of the spurge family, to have an especial fondness for railroads. At least one of its stations in Virginia, the state usually given as the northern limit of the species, is "along the railroad between Lynchburg and Danville" and probably other occurrences on the outer edge of its range are of a similar character. It would thus appear that the plant at Bishops Bridge has found a very congenial habitat and it would not be surprising if what is now such an unfamiliar species to local collectors should ultimately become a familiar member of the New Jersey flora.

Academy of Natural Sciences of Philadelphia.

THE GRAY HERBARIUM EXPEDITION TO NOVA SCOTIA, 1920.

M. L. Fernald.

(*Continued from p. 195.*)

Panicum Lindheimeri Nash. As already noted (p. 141) there is no constant character by which to distinguish from *P. Lindheimeri* the several plants subsequently published as species and separated by Hitchcock & Chase upon the minutest differences in size of spikelets and varying degrees of pubescence on the foliage. These plants, *P. tennesseense* Ashe, *P. huachucae* Ashe, and *P. implicatum* Scribner, have for a quarter-century baffled those who, not restricting their studies to the grasses, are in the habit of looking in other plants for essentially constant characters in species and who have long since learned that in other groups at least, fluctuating degrees of the same type of pubescence when unaccompanied by definite characters of the inflorescence give very unsatisfactory grounds for specific separa-

tion. More recently, further perplexity has been added to the group for those who are not intensive specialists on *Panicum* by the publication of *P. languidum* Hitchc. & Chase. The type collection was a clump growing in dry woods at South Berwick, Maine, with spikelets unusually large (1.8–2.1 mm. long) but otherwise not different from lax shade-forms of *P. huachucae*, the individuals of rich or shaded habitats separated by Hitchcock & Chase as *P. huachucae*, var. *silvicola*. The authors of *P. languidum* cite five collections: South Berwick, Maine, *Fernald, Parlin* (from the same clump); Island Falls, Maine, *Fernald;* Mt. Desert Island, *Fernald;* Ashburnham, Massachusetts, *Harris;* and Platte Clove, New York, *Williamson*.

I have not seen the New York material, but the South Berwick clump was broken into several full-sized sheets, three of which are before me. Their spikelets range from 1.8–2.1 mm. long (not merely 2 mm. as originally described) and the panicle is, as described by Hitchcock & Chase, "loosely flowered, the very flexuous branches finally spreading or drooping . . . the axis and branches sparsely long-pilose." The inflorescence is thus like the theoretical inflorescence of *P. implicatum* but looser and with longer spikelets or quite like that of many specimens determined by Hitchcock & Chase as *P. huachucae*, var. *silvicola*, a plant which they describe as having spikelets 1.6–1.8 mm. long. The leaves of the South Berwick material are inseparable from those of the latter plant. The other Maine specimens of *P. languidum* are like the type as are more recent collections from Massachusetts, but the Harris collection from Ashburnham, included with the original *P. languidum*, is quite different, having narrowly ellipsoid panicles with strongly spreading-ascending branches, the axis smooth and the sheaths pilose with ascending (not wide-spreading) hairs. This collection is represented by three sheets, thoroughly uniform and clearly a shade state of *P. subvillosum* Ashe. With the latter species eliminated from the complex, *P. languidum* is left as a series of specimens which in every character merge directly into *P. huachucae*.

The original of *P. Lindheimeri* was a plant with the axis of the panicle glabrous and with the lower internodes and sheaths papillose-hirsute, the upper glabrous, and Hitchcock & Chase place it in their section *Spreta* because it has "Sheaths glabrous or only the lowermost sometimes pubescent." *P. huachucae*, on the other hand, and

P. tennesseense are placed in the section *Lanuginosa* with "Sheaths strongly pubescent." The spikelet-measurements as given by them are: *P. Lindheimeri,* 1.4–1.6 mm. long; *P. huachucae* 1.6–1.8 mm. and *P. tennesseense,* 1.6–1.7 mm. The last, although placed in a group with "Sheaths strongly pubescent," is described as having "sheaths . . . rarely nearly glabrous," while in the "glabrous" *P. Lindheimeri* "sometimes the pubescence extends nearly to the summit. These more pubescent specimens . . . resemble less pubescent specimens of *P. tennesseense* but can be distinguished by the smaller spikelets." If the difference between the extremes of the spikelets were positive, the latter assurance would carry conviction; but when, measuring the spikelets of specimens labelled (and often cited) by Hitchcock & Chase as *P. tennesseense,* it is found that several sheets (Framingham, Mass., *E. C. Smith;* Providence, R. I., *Collins;* East Hartford, Conn., *Driggs;* Washington, D. C., *Steele;* Monteer, Mo., *Bush;* etc.) shows mature spikelets only 1.4–1.6 mm. long, while this minimum is exhibited by a sheet specially collected by Mrs. Chase and distributed to show true *P. tennesseense* (Am. Gr. Nat. Herb. no. 127); — when we find that *P. tennesseense* may have spikelets as small as in *P. Lindheimeri,* the effort to separate the two as species becomes futile. This futility is further emphasized by the plant of Yarmouth County, Nova Scotia, in habit so closely similar to the type-number of *P. Lindheimeri* as at first to seem identical with it, but with spikelets even larger than in *P. tennesseense,* 1.8–2 mm. long.

Panicum tennesseense, itself, as treated by Hitchcock & Chase, consists of two rather definite trends. Of the material in the Gray Herbarium and the herbarium of the New England Botanical Club so named by them 18 sheets have panicles with the lower internodes pilose as in *P. huachucae,* var. *silvicola,* which likewise has spikelets of the same size; while 25 have the axis of the panicle glabrous as in *P. Lindheimeri.* Some sheets of the latter plant from the St. John valley in northern Maine have been labeled by them *P. Lindheimeri;* others of the same plant, *P. tennesseense.* One sheet from Massachusetts (*Hubbard,* no. 205) with the characteristic panicle, long spikelets and pilose axis of *P. languidum* was determined by Mrs. Chase in 1911 as the latter species, but, naturally enough, in 1912 she changed the determination to *P. tennesseense;* naturally enough because, as the preceding discussion indicates, those species are merely phases of one polymorphous species, *P. Lindheimeri.*

Similarly with *P. huachucae* and *P. implicatum*, the lines between these and the others are vague, Hitchcock & Chase saying in a note upon the shade-state of the former (*P. huachucae*, var. *silvicola*), "The following specimens represent an extreme form with the upper surface of the blades nearly or quite glabrous, thus approaching *P. tennesseense*." Then follows an enumeration of 19 specimens to which the more recent collections would surely add many more, but the citation of 19 confessed intermediates is sufficient indication of the weakness of the species. *P. implicatum* is the extreme of the series with longest pubescence on the leaves, in its best development well pronounced but, to quote Hitchcock & Chase's apt phrase: "More robust specimens of *P. implicatum* approach *P. huachucae*." In New England and eastern Canada the distinctions between the two are most unsatisfactory and at best *P. implicatum* seems to be of varietal rank, as Scribner, who first published it as a species in 1898, regarded it in 1901.

Others, like *P. pacificum* Hitch. & Chase, seem hardly separable as species. *P. pacificum* has spikelets tending to be minutely larger than in *P. huachucae;* and its authors reason that, although "It most nearly resembles *P. huachucae*," it cannot be included in that species because of "a distinct range." The type of *P. huachucae* came from Huachuca Mts., Arizona, and Hitchcock & Chase cite material from San Bernardino Mts., California, while they allow *P. pacificum* to occur also in the San Bernardino Mts. and to extend eastward into Arizona. The ranges of the two are thus overlapping, the habit, foliage and pubescence identical, and the spikelets with overlapping measurements.

The variations above discussed seem better treated as a series of varieties of one wide-ranging and polymorphous species. as follows:

Axis of panicle glabrous or at most with few appressed hairs: leaf-blades glabrous or very sparsely pilose and glabrate above, glabrous or minutely pubescent beneath; upper sheaths glabrous to somewhat pilose.
- Spikelets 1.3–1.6 mm. long ..... Var. *typicum.*
- Spikelets mostly 1.6–2 mm. long ..... Var. *septentrionale.*

Axis of panicle spreading-pilose, at least on the lower internodes: leaf-blades pilose to glabrous above, commonly pubescent beneath; upper sheaths mostly pilose.
- Spikelets mostly 1.6–2.1 mm. long: leaf-blades closely short-pilose, sparsely long-pilose or glabrous above. Var. *fasciculatum.*
- Spikelets mostly 1.3–1.5 mm. long: leaf-blades long-pilose above, with hairs mostly 3–6 mm. long ..... Var. *implicatum.*

P. Lindheimeri Nash, var. **typicum**. *P. Lindheimeri* Nash, Bull. Torr. Bot. Cl. xxiv. 196 (1897); Hitchcock & Chase, Contrib. U. S. Nat. Herb. xv. 203 (1910). *P. Funstoni* Scribn. & Merr. U. S. Dept. Agr. Div. Agrost. Circ. xxxv. 4 (1901).—California to Florida, north to Minnesota, southern Ontario and New England.

** Var. **septentrionale**, n. var. Planta laxe vel dense cespitosa 2–7 dm. alta; vaginis glabris vel plus minusve pilosis pilis divergentibus, laminis firmis utrinque glabris vel sparse breviterque pilosis; paniculis primariis ovoideis 2.5–7 cm. longis rhachi glabro; spiculis plerumque 1.6–2 mm. longis.—Nova Scotia and New Brunswick to Manitoba, south to Connecticut, New York, Indiana and Missouri. The following are representative of a series of about 100 sheets studied. Nova Scotia: wet sphagnous swale at border of Beaver Lake, Yarmouth Co., July 25, 1920, *Long* & *Linder*, no. 19,805, October 6, 1920, *Fernald* & *Linder*, no. 19,814 (unusually tall and little tufted from growing in a dense swale). New Brunswick: river-gravels and shingly border of thicket by the St. John River, Woodstock, July 14, 1916, *Fernald* & *Long*, no. 12,527 (type in Gray Herb.); recent clearing, Ingleside, Westfield, August 7, 1909, *Fernald*, no. 1255; gravelly shore of the basin, Gorge of the Aroostook River, *Fernald*, no. 1250. Maine: St. John River at mouth of Little Black River, July 27, 1900, *Collins* & *Williams;* gravelly shores of St. John River, St. Francis, August 5, 1893, *Fernald*, no. 166a; Fort Kent, August 1, 1900, *Collins* & *Williams;* river-thicket, Fort Fairfield, August 10, 1909, *Fernald*, no. 1257; sandy river-bank (Penobscot River), Bradley, September 16, 1897, *Fernald;* sandy clearings and pastures, Fairfield, July 24, 1916, *Fernald* & *Long*, no. 12,751; dry wooded slope of Mt. Megunticook, Camden, August 13, 1913, *Fernald;* in sand, Canton, July 7, 1906, *Parlin*, no. 1958; edge of cliff, Ogunquit, Wells, July 15, 1903, *Parlin*, no. 1577. New Hampshire: sandy pasture, Shelburne, July 21, 1913, *Deane;* roadside, Stewartstown, July 19, 1917, *Fernald* & *Pease*, no. 16,826; railroad track, Stratford, July 18, 1917, *Fernald* & *Pease*, no. 16,810; dry soil, Northumberland, *Fernald* & *Pease*, no. 16,811; gravelly bank of Pemigewasset River, North Woodstock, July 7, 1915, *Fernald*, no. 11,515; sandy river-terraces above Plymouth, July 30, 1915, *Fernald*, no. 11,516; Nashua, June 24, 1903, *Robinson*, no. 789. Vermont: Willoughby Mt., Westmore, *Horace Mann et al.* (axis slightly pubescent, approaching that of var. *fasciculatum*). Massachusetts: gravel, Manchester, July 15, 1913, *Hubbard*, no. 655; Holbrook, June 18, 1899, *Greenman*, no. 3133; Rehoboth, June 22, 1914, *Forbes;* sand-plain, Springfield, June 8, 1913, *Fernald*, no. 8650; woodroad near Shaw Pond, Becket, July 28, 1916, *Hoffmann;* rocky roadside, Mt. Washington, August 11, 1914, *Hoffmann;* wet sandy roadside, Stockbridge, June 20, 1914, *Hoffmann;* dry clearings and open woods on sericite schist, near summit of Serpentine Ledge, Florida, June 24, 1913, *Fernald* & *Long*, no. 8620. Rhode Island: sterile meadow,

Warwick, June 25, 1910, *Fernald*. Connecticut: sandy soil, South Windsor, June 23, 1916, *Driggs;* dry soil, Manchester, July 9, 1904, *Driggs*, no. 2927; wet meadow, Southington, July 13, 1901, *Andrews;* moist roadside, Danbury, July 19–20, 1912, *Harger*. New York: bank of St. Regis River, Stockholm, July 1, 1916, *O. P. Phelps*, no. 1450; swamp, Norfolk, June 30, 1915, *Phelps*, nos. 1100, 1101; dry rocks, Murray Island, Jefferson Co., July 4, 1902, *Robinson* & *Maxon*, no. 86; sandy fields, Albany, June 10, 1918, *House;* dry gravel, Ulysses, July 22, 1913, *Wiegand* & *Palmer*, no. 89. Ontario: Cache Lake, Algonquin Park, June 20, 1900, *Macoun*, no. 72,965 in part (mixed with *P. boreale*); Toronto, June 7, 1911, *J. White*, no. 8. Indiana: sand ridges, Roby, September 2, 1907, *Lansing*, no. 2687; swale, Edgemoor, July 24, 1906, *Lansing*, no. 2606; sand ridges, East Chicago, August 10, 1910, *Lansing*, no. 2801. Mantioba: Lake Winnipeg Valley, 1857, *Bourgeau*. Minnesota: moist sand, Hubert, July 25, 1913, *Bergman*, no. 2879. Missouri: barrens, Monteer, May 24, 1907, *Bush*, no. 4684.

Var. **fasciculatum** (Torr.), n. comb. *P. dichotomum*, β. *fasciculatum* Torr. Fl. No. and Mid. U. S. 145 (1824). *P. nitidum* α. *ciliatum* and δ. *pilosum* Torr. l. c. 146 (1824). *P. huachucae* Ashe, Journ. Elisha Mitchell Soc. xv. 51 (1898). *P. tennesseense* Ashe, l. c. 52 (1898). *P. unciphyllum*, forma *prostratum* Scribn. & Merr. Rhodora, iii. 124 (1901). *P. languinosum*, var. *huachucae* (Ashe) Hitchc. Rhodora, viii. 208 (1906). *P. huachucae*, var. *silvicola* Hitchc. & Chase in Robinson, Rhodora, x. 64 (1908). *P. pacificum* Hitchc. & Chase, Contrib. U. S. Nat. Herb. xv. 229 (1910). *P. languidum* Hitchc. & Chase, l. c., 232 (1910). *P. huachucae*, var. *fasciculatum* (Torr.) Hubbard, Rhodora, xiv. 171 (1912).—Southern California to Florida, north to southern British Columbia, Idaho, Montana, South Dakota, Minnesota, Ontario, Quebec and Newfoundland.

In its typical form the variety has loosely spreading leaves. *P. huachucae* is a trivial form, of more open habitats and therefore with stiffer and more ascending foliage. *P. unciphyllum*, forma *prostratum* (basis of *P. languidum*) is a shade form with tendency to looser inflorescences and slightly longer spikelets.

In Nova Scotia var. *fasciculatum* is common from Yarmouth to Sable Island and Pictou Co.

Var. **implicatum** (Scribn.), n. comb. *P. implicatum* Scribn. U. S. Dept. Agric. Div. Agrost. Bull. 11: 43. fig. 2 (1898). *P. unciphyllum implicatum* Scribn. & Merrill, Rhodora, iii. 123 (1901).—Newfoundland to southern New York, west to Ontario, Wisconsin and Iowa.

Common in western Nova Scotia, often too close to the last.

P. subvillosum Ashe. Common on dry sandy or rocky open soil throughout the silicious regions from Yarmouth Co. to Halifax and Cumberland Cos., thence on into eastern New Brunswick and Prince Edward Island. See p. 103.

* *Setaria viridis* (L.) Beauv., var. *Weinmanni* (R. & S.) Brand; Fernald & Wiegand, Rhodora, xii. 133 (1910). This easily recognized variety, now widely dispersed as a weed in eastern Canada, occurs in the railroad yard at North Sydney and presumably elsewhere.

** Leersia oryzoides (L.) Sw., forma clandestina E. H. Eames, Rhodora, xviii. 239 (1916). This form seems to be more common in Nova Scotia than the typical form of the species, with exserted panicles. In all our Nova Scotian collections of both forms the spikelets are unusually long, 5–6 mm.

** L. oryzoides, forma glabra A. A. Eaton, Rhodora, v. 118 (1903). In New England this form is characteristic of tidal flats, but in Trefry's Lake, Arcadia (Yarmouth Co.) completely submersed colonies had the sheaths essentially as smooth as in Eaton's original material, thus suggesting that the smoothness is a result of submergence.

Milium effusum L. To the Cape Breton record should be added Hants Co.: alluvium of Five-Mile River. See pp. 136, 170.

* Oryzopsis canadensis (Poir.) Torr. *Stipa canadensis* Poir. Dry open barrens, Springhill Junction (Cumberland Co.); thence northward into New Brunswick and eastward to Prince Edward Island and Newfoundland. See p. 132.

O. asperifolia Michx. Common on peaty or sterile woodland soil, throughout.

Muhlenbergia racemosa (Michx.) B. S. P. Common in peaty swales and savannahs, apparently throughout.

Alopecurus geniculatus L. Recorded by Macoun only from Halifax, but common in ditches and shallow pools near towns in Yarmouth and Shelburne Cos.; also Baddeck. See p. 95.

** *A. geniculatus*, var. *microstachyus* Uechtr. in Fiek, Fl. von Schlesien, 500 (1881). This variety with small panicles (mostly 1–2 cm. long) is abundant in some roadside ditches at Yarmouth.

A. aristulatus Michx. *A. geniculatus*, var. *aristulatus* (Michx.) Torr. Cumberland Co.: spring-pools and ditches south of Amherst.

* Sporobolus uniflorus (Muhl.) Scribn. Not recorded in Macoun's *Catalogue* from Canada. Common in peat and wet sand from Yarmouth Co. eastward at least to Annapolis and Shelburne Cos.; also in Newfoundland. Recently collected about Georgian Bay, Ontario,—see J. M. Macoun, Ottawa Nat. xxiii. 192 (1910).

** Agrostis hyemalis (Walt.) B.S.P., var. **elata** (Pursh), n. comb. *Trichodium elatum* Pursh, Fl. Am. Sept. i. 61 (1814). *A. elata* (Pursh) Trin. Mém. Acad. St. Pétersb. sér. 6, vi. pt. 2, 317 (1841). *A. perennans elata* (Pursh) Hitchc. U. S. Dept. Agric. Bur. Pl. Ind. Bull. no. 68: 50 (1905). For discussion see p. 155.

Known northeast of Long Island and Nantucket only from barrens of Nova Scotia, the Magdalen Islands and Newfoundland. The

following specimens, many of them distributed as *A. hyemalis*, var. *geminata* (Trin.) Hitchc. into which var. *elata* seems to pass, are characteristic. Newfoundland: swampy woods, Bell Island, Conception Bay, *Howe & Lang*, no. 1302 (awned form with panicles 3 dm. long); serpentine tablelands, alt. 380 m., Bonne Bay, *Fernald & Wiegand*, no. 2514 (awned); open peat bogs, Birchy Cove (Curling), *Fernald & Wiegand*, no. 2513 (awned). Magdalen Islands: wet bogs among the sand ridges back of the Narrows, Alright Island, *Fernald, Long & St. John*, no. 6850 (awnless); dry open woods and clearings and sphagnous bog near Étang du Nord village, Grindstone I., *Fernald, Bartram, Long & St. John*, nos. 6847, 6848 (awnless); wet bogs and mossy pond-margins among sandhills between East Cape and East Point, Coffin I., *Fernald, Long, & St. John*, no. 6851 (awned); dunes de la Pointe-de-l'Est, Ile de la Grande-Entrée, *Marie-Victorin & Rolland-Germain*, no. 9018 (awnless); sur la Dune du Nord, Grand Étang, *Marie-Victorin & Rolland-Germain*, no. 9017; dry clearing, Brion Island, *St. John*, no. 1766 (awnless). Nova Scotia: Canso, *J. Fowler* (awned); Sable Island, *St. John*, nos. 1136, 1365 (awnless); springy sphagnous bog near mouth of Broad River, *Fernald & Bissell*, no. 19,913 (awnless); wet peaty sloughs in barrens, Lower Argyle, *Fernald, Bissell, Graves, Long & Linder*, no. 19,911 (awnless); swampy spruce woods, Belleville, *Long & Linder*, no. 19,900; sphagnous swale bordering Salmon (Greenville) Lake, Yarmouth Co., *Fernald, Bissell, Graves, Long & Linder*, no. 19,912 (awnless); dryish sphagnous swales and bogs by Harris's Lake, Tiddville, Digby Co., *Fernald & Long*, no. 19,914 (awnless).

* A. perennans (Walt.) Tuckerm. Common throughout, especially in woodlands and thickets and on banks of streams. Highly variable and perhaps more than a single species.

Calamagrostris Pickeringii Gray. Boggy barrens, Digby and Yarmouth Cos. to Queens. Less common than the next. Previously recorded only from Cape Breton. See p. 161.

Calamagrostis Pickeringii Gray, var. debilis (Kearney) Fernald & Wiegand, Rhodora, xv. 135 (1913). Common on sphagnous bogs and peaty barrens, Digby and Yarmouth Cos. to Queens. Previously unknown between Massachusetts and Cape Breton. See pp. 99, 148.

* C. neglecta (Ehrh.) Gaertn., Meyer & Scherb. Springy swales south of Amherst, thence common northward in eastern New Brunswick, Prince Edward Island and the Magdalen Islands. See p. 131.

Ammophila breviligulata Fernald, Rhodora, xxii. 71 (1920). Common throughout, on sandy shores and dunes.

* Sphenopholis pallens (Spreng.) Scribn. Talus and crevices of gypsum cliffs, Port Bevis (Victoria Co.) and Five-Mile River (Hants Co.). See pp. 164, 170.

* *Avena fatua* L. Waste places, Yarmouth. See p. 136.

* Danthonia compressa Aust. Dry thickets and borders of woods, Yarmouth to Annapolis and Halifax Cos.

In Nova Scotia as elsewhere *Danthonia* is amazingly variable and it is impossible to draw lines with the definiteness of current treatments. The plant here treated as *D. compressa* is a good match for Austin's original material and may so pass until the genus can be satisfactorily studied.

** SPARTINA ALTERNIFLORA Loisel., var. PILOSA (Merr.) Fernald, RHODORA, xviii. 179 (1916). Marshes along Sissiboo River, Weymouth.

** SIEGLINGIA DECUMBENS (L.) Bernh. Peaty or wet sandy soils, YARMOUTH CO.: Cedar Lake; Yarmouth; Lily Lake; Arcadia; Trefry's Lake; Tusket. Possibly indigenous, but growing in half-cultivated areas. See pp. 95, 143, 151.

DISTICHLIS SPICATA (L.) Greene. Borders of salt marshes. YARMOUTH CO.: Sand Beach. VICTORIA CO.: Baddeck Bay. Recorded by Nichols from northern Cape Breton. See p. 164.

** POA COSTATA Schumacher, Enum. Pl. Saell. i. 28 (1801). See pp. 133, 139, 164. Mossy woods and glades. ANNAPOLIS CO.: southern slope of North Mt., near Middleton. HANTS CO.: Truro. VICTORIA CO.: Port Bevis.

P. TRIVIALIS L. Spruce swamps and springy ditches, Yarmouth and Shelburne Cos., often seeming like an indigenous plant as it does on Cape Cod and in Newfoundland.

P. SALTUENSIS Fernald & Wiegand, RHODORA, xx. 122 (1918). To the Cape Breton stations cited in the original description should be added HANTS CO.: woods along Five-Mile River. CUMBERLAND CO.: swampy woods, Springhill Junction.

* GLYCERIA OBTUSA (Muhl.) Trin. Common in peaty swales and bogs of Yarmouth Co. and southern Digby Co.

G. LAXA Scribn. Common in swales and borders of spruce swamps, Digby and Yarmouth Cos. to Queens. Reported by Nichols from Cape Breton. Common on Prince Edward Island.

** G. GRANDIS Watson, forma **pallescens**, n. f., spiculis flavescentibus.

Spikelets yellowish.—NOVA SCOTIA: brooksides and wet meadows, Yarmouth, July 4, 1920, *Bissell, Pease, Long* & *Linder*, no. 20,026 (TYPE in Gray Herb.). MAINE: Dover, September 1, 1894, *Fernald*, no. 564; Greenvale, 1894, *Kate Furbish*.

* G. PALLIDA (Torr.) Trin. Boggy swales and savannahs of the Tusket River, Yarmouth Co. Previous records from Nova Scotia rest on the common G. FERNALDII (Hitchc.) St. John, RHODORA, xix. 76 (1917). See p. 166.

PUCCINELLIA MARITIMA (Huds.) Parl. Common on salt marshes and sea-strands from Shelburne and Yarmouth Cos. to Hants. See pp. 94, 102.

P. PAUPERCULA (Holm.) Fernald & Weatherby, var. ALASKANA (Scribn. & Merrill) Fernald & Weatherby, RHODORA, xviii. 18 (1916). Common on saline shores throughout the province.

Festuca rubra L., var. glaucescens (Hegetschw. & Heer) Richter. Sand dunes, Villagedale (Shelburne). Recorded by St. John from Sable Island.

* *F. capillata* Lam. Dry open soil, Shelburne and Yarmouth Cos. to Cumberland Co. Perhaps indigenous.

F. nutans Spreng. Alluvial woods, Five-Mile River (Hants). The old record from Halifax needs verification as the species belongs in rich alluvium or limy woodlands. See pp. 136, 170.

Bromus secalinus L. Railroad gravel along Five-Mile River (Hants).

* *B. commutatus* Schrad. Common in waste ground and about wharves or railroad yards, Yarmouth to Weymouth.

* *B. inermis* Leyss. Waste ground near wharf, Yarmouth.

Agropyron pungens (Pers.) R. & S. Gravel beaches of Great Bras d'Or Lake, clearly passing into the next.

A. pungens, var. **acadiense** (Hubbard), n. comb. *A. acadiense* Hubbard, Rhodora, xix. 15 (1917). Collected at the original station, gravel beach of Great Bras d'Or, Grand Narrows; also beaches of Kidstone Island and saline shore near mouth of George River. See p. 165.

A. repens (L.) Beauv., var. pilosum Scribn., Bull. U. S. Div. Agrost. no. 4, 36 (1897). A characteristic indigenous variety of the coast of New England and eastern Canada. Seen at various stations on the coast of Yarmouth Co.

** A. caninum (L.) Beauv., forma glaucum Pease & Moore, Rhodora, xii. 71 (1910). Thicket at upper border of gravel beach of Great Bras d'Or, Kidstone Island (Victoria Co.).

* A. caninum, var. tenerum (Vasey) Pease & Moore, Rhodora, (1910). *A. tenerum* Vasey. Thickets bordering sea-beaches and borders of brackish marshes or on limy talus. Yarmouth Co.: beach of Eel Lake; marsh at head of Abram River. Shelburne Co.: Villagedale. Queens Co.: Port Mouton. Hants Co.: gypsum cliffs, Five-Mile River. Cape Breton Co.: Grand Narrows.

** Elymus virginicus L., var. hirsutiglumis (Scribn.) Hitchc. Barrier beach, Sand Beach (Yarmouth Co.). See p. 151.

E. arenarius L., var. villosus E. Meyer. Gravelly strands of Yarmouth and Shelburne Cos. See p. 99.

* Asperella hystrix (L.) Humb. *Hystrix patula* Moench. Alluvial woods along Five-Mile River (Hants). See pp. 136, 170.

** Cyperus dentatus Torr. Sandy and gravelly beaches of many lakes in Yarmouth Co. See p. 142.

* Eleocharis Robbinsii Oakes. Lake-margins and bog-pools. Digby Co.: Tiddville. Yarmouth Co.: Argyle; Great Pubnico Lake. Collected by Howe & Lang at Windsor Junction, Halifax Co. See pp. 99, 149, 162.

* E. olivacea Torr. Margin of pond-hole in the savannah along Little River, east of Tiddville, Digby Co. See p. 162.

E. OBTUSA (Willd.) Schultes. Seen in the southwestern counties only at Springhaven, Yarmouth Co. Frequent from Annapolis Co. eastward.

E. UNIGLUMIS Schultes. *E. palustris*, var. *glaucescens* of American authors. Brackish and saline shores, common.

** E. TUBERCULOSA (Michx.) R. & S., var. **pubnicoensis**, n. var., a forma typica differt squamis castaneis; setis perianthii laevibus; achaeniis superne evidenter constrictis pallide viridibus; tuberculo viridiscenti deltoideo-ovato vix inflato achaeniis minore.

Differing from the typical form in its castaneous scales: perianth-bristles smooth: achenes definitely constricted to a thick neck, pale green: tubercle greenish, deltoid-ovate, scarcely inflated, smaller than the achene.—NOVA SCOTIA: boggy savannah and sandy beach by Great Pubnico Lake, Yarmouth Co., September 6, 1920, *Fernald, Long & Linder*, nos. 20,163 (TYPE in Gray Herb.), 20,164. See pp. 167, 169.

In typical *E. tuberculosa* of the coastal plain the scales are paler, often whitish; the bristles barbed; the achene rarely with a definite neck and in maturity deeper colored or even olive and the whitish almost inflated tubercle closely sessile and usually as large as or larger than the achene.

** E. ROSTELLATA Torr. Saline or brackish marshes and swales of YARMOUTH CO.: Sand Beach, Chebogue, Tusket, Argyle. See pp. 103, 105, 110, 149.

SCIRPUS NANUS Spreng. Recorded by Macoun and by Nichols from Cape Breton, and by St. John from Sable Island. On several marshes of Digby and Yarmouth Cos.

* S. PAUCIFLORUS Lightf. Springy border of salt marsh at head of Baddeck Bay, Victoria Co. See p. 164.

S. CESPITOSUS L., var. CALLOSUS Bigel.; Fernald, RHODORA, xxiii. 24 (1921). Abundant on dryish peaty barrens of Digby, Yarmouth and Shelburne Cos. and on Cape Breton. Doubtless general on the Atlantic slope of the peninsula. See pp. 99, 148.

S. HUDSONIANUS (Michx.) Fernald. Frequent from Cape Breton to Digby Neck and Cumberland and Lunenburg Cos. See p. 131.

S. SUBTERMINALIS Torr. Sandy and peaty pools and lake-margins, Yarmouth Co. to Hants, and presumably general. Recorded by Macoun and by Nichols from northern Cape Breton. See p. 148.

S. RUFUS (Huds.) Schrad. Brackish or saline marsh, Sand Beach, Yarmouth Co. See p. 103. Recorded by Nichols from northern Cape Breton.

** S. OLNEYI Gray. Salt and brackish marshes and swales of YARMOUTH CO.: Sand Beach, Chebogue, Arcadia, Tusket, Eel Lake. See pp. 103, 110, 142.

S. VALIDUS Vahl. Brackish or calcareous pools, frequent throughout.

S. ACUTUS Muhl. *S. occidentalis* (Watson) Chase. Lake-margins, swales and brackish marshes, frequent throughout. See pp. 101, 110, 131.

* S. CAMPESTRIS Britton, var. FERNALDII (Bicknell) Bartlett. Salt marsh at head of Baddeck Bay. Frequent on the eastern coast of New Brunswick and on Prince Edward Island.

S. ATROVIRENS Muhl., var. GEORGIANUS (Harper) Fernald, RHODORA, xxiii. 134 (1921). Swales and damp thickets, occasional eastward to Halifax Co.

** S. CYPERINUS (L.) Kunth. Peaty and cobbly beach of a large lake north of Saller Lake, Kemptville (Yarmouth Co.). The common plant of Nova Scotia is var. PELIUS Fernald.

* S. PEDICELLATUS Fernald. Wooded bank of Sissiboo River, Weymouth.

* ERIOPHORUM ANGUSTIFOLIUM Roth, var. MAJUS Schultes. Boggy savannah bordering Great Pubnico Lake, Yarmouth Co. Typical E. ANGUSTIFOLIUM is very common throughout the province.

E. VIRIDI-CARINATUM (Engelm.) Fernald. Common on Cape Breton. Not seen west or southwest of Hants Co.

RYNCHOSPORA FUSCA (L.) Ait. Wet peaty and sandy bogs and shores, very common in Digby and Yarmouth Cos.; also Cape Breton.

* R. CAPITELLATA (Michx.) Vahl. See Blake, RHODORA, xx. 27 (1918). Frequent on lake-shores, savannahs and peaty openings in the western counties. YARMOUTH Co.: common in the Tusket Valley; Salmon (Greenville) Lake. QUEENS Co.: Port Mouton and Broad River. HALIFAX Co.: Shubenacadie Grand Lake. See p. 134.

** R. CAPITELLATA, var. DISCUTIENS (Clarke) Blake, l. c. 28 (1918). Local in YARMOUTH Co.: gravelly margin of Tusket (Vaughan) Lake; wet mossy brook-side by small pond near Argyle Head; sandy shore of Great Pubnico Lake. See pp. 149, 160.

** CLADIUM MARISCOIDES (Muhl.) Torr., forma **congestum**, n. f., inflorescentiis congestis radiis suppressis vel brevissimis, glomerulis plerumque e spiculis 15–30 compositis.

Inflorescences congested, the rays suppressed or very short; glomerules mostly with 15–30 spikelets.—NOVA SCOTIA: with the typical form of the species at peaty margin of Harris's Lake, Tiddville, Digby Co., August 22, 1920, *Fernald* & *Long*, no. 20,286 (TYPE in Gray Herb.).

** CAREX SCOPARIA Schkuhr, forma **peracuta**, n. f., spicis approximatis anguste rhomboideis apice valde attenuatis vel subcaudatis.

Spikes approximate, narrowly rhomboid, strongly attentuate or subcaudate at apex.—NOVA SCOTIA: springy ditch, Sand Beach, Yarmouth County, July 14, 1920, *Fernald* & *Long*, no. 20,296 (TYPE in Gray Herb.); damp roadside, east of Rockville, Yarmouth County, July 14, 1920, *Pease* & *Linder*, no. 20,289. See p. 107.

C. SCOPARIA, var. SUBTURBINATA Fernald & Wiegand, RHODORA, xiv. 116 (1912). Collected by us at one of the original stations, Meteghan; also at Deerfield, Yarmouth Co.

** C. SCOPARIA, var. TESSELLATA Fernald & Wiegand, RHODORA, xii. 135 (1910). Wet sandy and gravelly swales and roadsides, Belleville, Yarmouth Co. (scales almost black, darker than in the original material).

* C. CRAWFORDII Fernald. Swales and damp peaty barrens, Cumberland Co. to Cape Breton, west to Annapolis and Queens Cos.

C. PROJECTA Mackenzie. *C. tribuloides*, var. *reducta* Bailey. Meadows and damp thickets, apparently throughout the province. This includes the Nova Scotia material recorded by Macoun as *C. cristata.*

* C. ALBOLUTESCENS Schwein., var. CUMULATA Bailey. Dry or moist open barrens, frequent from Yarmouth to Lunenburg and Cumberland Cos., thence into New Brunswick and Prince Edward Island. Perhaps specifically distinct. See pp. 132, 138, 150. Ordinarily, the round-based spikes are densely crowded but in one collection (no. 20,311 from Broad River, Queens) a single tuft shows both crowded and moniliform inflorescences; the latter 1 dm. long, with 7 remote spikes.

** C. **albolutescens** var. **cumulata** × **scoparia**, n. hybr., *C. scopariam* simulans, sed foliis latioribus; spicis brunneis late obovoideis apice truncatis; perigyniis ovatis vel obovatis plerumque vacuis.

Similar to *C. scoparia* but with broader leaves: spikes brown, broadly obovoid, truncate at summit: perigynia ovate or obovate, mostly empty.—NOVA SCOTIA: with the parents but more abundant than either, damp *Polytrichum*-covered sandy plains, Middleton, Annapolis Co., July 20, 1920, *Fernald, Pease* & *Long*, no. 20,327 (TYPE in Gray Herb.). See p. 138.

** C. STRAMINEA Willd. Rare. YARMOUTH Co.: low woods and thickets by Butler's (Gavelton) Lake, Gavelton. SHELBURNE Co.: thicket bordering salt marsh, Villagedale; moist *Polytrichum*-covered barrens near Clement Pond, Barrington.

This is *C. straminea* as interpreted by Mackenzie (Bull. Torr. Bot. Cl. xlii. 605), a coastal plain species recognized by Mackenzie as extending from Louisiana to southern New York. Subsequently, Bicknell (Bull. Torr. Bot. Cl. xliv. 377) has reported it from Nantucket, Mr. F. C. Seymour has found it on Martha's Vineyard and I have collected it in swampy thickets on Cape Cod. The plant called *C. straminea* in Gray's Manual, ed. 7, is *C. tenera* Dewey.

C. HORMATHODES Fernald. Brackish or fresh marshes not far from the sea, common throughout the province. Macoun's report of *C. straminea*, var. *festucacea* from Baddeck was based on material of *C. hormathodes.*

C. SILICEA Olney. Sands, barrier beaches and rocks of the outer coast, from Yarmouth Co. to Cape Breton. See pp. 141, 150, 158.

* C. BEBBII Olney. Seen only in CAPE BRETON Co.: boggy swale on hillside near limestone quarry, George River. See p. 165.

* C. FOENEA Willd., var. PERPLEXA Bailey. Sandy thicket, Middleton, Annapolis Co. See p. 138.

C. leporina L. Common in springy or seepy fields and roadsides, Digby, Yarmouth and Shelburne Cos. See p. 95.

*C. AENEA Fernald. Apparently rare in Nova Scotia. YARMOUTH Co.: dry *Polytrichum*-covered barrens near head of Abram River. CUMBERLAND Co.: dry open barrens, Springhill Junction. See pp. 132, 142. Collected by Macoun at Point Pleasant, Halifax, this plant erroneously referred by me in Proc. Am. Acad. xxxvii. 471 (1902) to *C. pratensis* Drej.

C. EXILIS Dewey. Bogs and peaty barrens, throughout the province. See pp. 96, 161.

C. ATLANTICA Bailey. *C. sterilis* of Gray's Man. ed. 7. Common on bogs and peaty barrens from Yarmouth to Annapolis Co. and southeastern Guysboro Co. (Canso, *Fowler*). See pp. 96, 99, 104, 138.

** C. HOWEI Mackenzie, Bull. Torr. Bot. Cl. xxxvii. 245 (1910). *C. scirpoides*, var. *capillacea* (Bailey) Fernald. Wet woods and thickets and boggy swales, abundant in Digby and Yarmouth Cos. See pp. 96, 104.

C. DEWEYANA Schwein. Rich woods, Annapolis Co. to Victoria Co. See p. 136.

C. TRISPERMA Dewey, var. BILLINGSII Knight. Characteristic of dryish knolls in bogs and peaty barrens throughout the province; typical C. TRISPERMA being characteristic of mossy woods and wet thickets. See p. 99.

C. NORVEGICA Willd. To the few recorded stations may be added: salt marshes at Sand Beach and Chebogue (Yarmouth Co.) and marshes along George River (Cape Breton Co.). See p. 103.

C. TENELLA Schkuhr. Mossy woods, Hants and Halifax Cos. to Cape Breton.

C. ROSEA Schkuhr. To the very few recorded stations should be added: alluvial woods along Five-Mile River, Hants Co. See pp. 136, 170.

* C. ROSEA, var. RADIATA Dewey. Rich woods near gypsum cliffs along Five-Mile River, Hants Co.

* C. VULPINODEA Michx. Roadside ditch, Middleton, Annapolis Co.

C. DIANDRA Schrank. Springy bogs and swales, Cumberland and Hants Cos. to Cape Breton. See p. 131.

C. CRINITA Lam. Frequent in the western Counties. The easternmost specimens seen are from Pictou Co.

* C. CRINITA, var. GYNANDRA (Schwein.) Schwein. & Torr. Generally distributed from Yarmouth Co. to Cape Breton.

* C. LENTICULARIS Michx. Gravelly and sandy lake-margins, Yarmouth Co. to Halifax Co., and probably eastward. See p. 102.

C. GOODENOWII J. Gay, var. STRICTIFORMIS (Bailey) Kükenthal in Engler, Pflanzenr. iv. Fam. 20: 316 (1909). This is the most extreme variation we have of *C. Goodenowii;* being usually cespitose, with tall culms and conspicuously stipitate perigynia. Widely distributed in brackish or fresh soils in Nova Scotia. See p. 157.

C. AUREA Nutt. Damp calcareous or argillaceous soil, Annapolis Co. to Cape Breton. See pp. 133, 165, 170.

C. PAUCIFLORA Lightf. One of the most characteristic species of sphagnous bogs. See pp. 96, 99.

C. POLYGAMA Schkuhr. Occasional throughout the province in peaty or gravelly soils. See pp. 101, 135.

C. VIRESCENS Muhl., var. SWANII Fernald. Local in YARMOUTH Co.: dryish peaty barrens, Yarmouth; boggy pasture, Centre Chebogue.

C. GRACILLIMA Schwein. Dry or moist woods and thickets, Cumberland Co. to Digby Co. and Cape Breton.

* C. UMBELLATA Schkuhr., var. TONSA Fernald. Dry open soil, Yarmouth Co. to Lunenburg and Annapolis Cos. See p. 130.

C. VARIA Muhl. Abundant in dry or moist peaty soil, even on knolls in sphagnous bogs, Yarmouth and Shelburne Cos.

* C. PENNSYLVANICA Lam., var. LUCORUM (Willd.) Fernald. Dry rocky and gravelly soil by railroad, west of Bridgewater, Lunenburg Co. See p. 130.

C. PANICEA L. On damp argillaceous grassy or peaty slopes, local, perhaps introduced but now thoroughly naturalized. YARMOUTH Co.: Yarmouth; Chebogue; Lower Argyle. SHELBURNE Co.: Shag Harbor. See pp. 95.

C. EBURNEA Boott. Characteristic of dry crevices of gypsum outcrops. Recorded by Nichols from northern Cape Breton. Seen by us on gypsum at Five-Mile River (Hants) and Port Bevis (Victoria). See pp. 136, 164, 170.

C. LEPTONERVIA Fernald, RHODORA, xvi. 214 (1914). Rich woods and thickets, generally distributed through the province, but rare southwestward. Macoun's record of *C. laxiflora,* var. *patulifolia* was based on this species.

C. CONOIDEA Schkuhr. Sterile or peaty fields and meadows, frequent from Yarmouth to Halifax and Pictou Cos.

C. FLAVA L. Frequent or common throughout.

* C. CRYPTOLEPIS Mackenzie, Torreya, xiv. 157 (1914). Less common than *C. flava.* Seen by us only in HANTS Co.: swaley border of pond near Five-Mile River.

C. OEDERI Retz. YARMOUTH Co.: sphagnous swale bordering Beaver Lake; gravelly and rocky shore of Lake Annis. ANNAPOLIS Co.: swales and low pastures near Bay of Fundy, Margaretville, the long-spiked ** forma ELATIOR (N. J. Anders.) Kükenth. Col-

lected in typical form at Baddeck, July 11, 1898, by John Macoun (no. 20,810; distributed as *C. extensa*).

C. Oederi, var. pumila (Coss. & Germ.) Fernald. Common, and apparently freely hybridizing with *C. flava*.

C. arctata Boott. Woods and rich thickets, Cumberland Co. to Digby Co. and Cape Breton.

C. scabrata Schwein. Alluvial woods, Annapolis Co. to Colchester Co.; Victoria Co. See pp. 136, 140.

C. oligosperma Michx. Boggy swales and barrens, locally abundant. Yarmouth Co.: Argyle; Kegeshook Lake. Queens Co.: Port Mouton. See pp. 99, 148, 167, 169.

* C. riparia W. Curtis, var. lacustris (Willd.) Kükenthal. Local. Yarmouth Co.: border of brackish marsh, Sand Beach. Hants Co.: pond-hole near Five-Mile River. See p. 137.

C. Pseudo-Cyperus L. Frequent in boggy swales from Annapolis and Queens Cos. to Cape Breton.

C. retrorsa Schwein. Alluvial woods and swales, Annapolis Co. to Cape Breton. See p. 164.

C. lupulina Muhl. Seen in western Nova Scotia only in a swale at Carleton, Yarmouth Co.

* C. intumescens Rudge, var. Fernaldii Bailey. Occasional throughout the province.

C. folliculata L. Recorded by Macoun from Halifax, by Nichols from northern Cape Breton. Characteristic of swales, boggy thickets and wet woods throughout the silicious regions of Digby and Yarmouth Cos.

C. vesicaria, var. jejuna Fernald. Digby Co.: sandy beach of Lily Lake, Sandy Cove.

** C. bullata Schwein., var. Greenei (Boeckl.) Fernald. Swales, boggy meadows, and wet woods, abundant from Digby, Yarmouth and Shelburne Cos. to Queens. See pp. 97, 99, 104, 150.

Arisaema triphyllum (L.) Schott, var. Stewardsonii (Britton) Stevens. The only material of *A. triphyllum* seen by us in Nova Scotia belonged to var. *Stewardsonii*. See p. 136.

Calla palustris L. Rare in western Nova Scotia. Seen only at the quaking margin of Trefry's Lake, Arcadia, Yarmouth Co. See p. 145.

Symplocarpus foetidus (L.) Nutt. Springy swales, open bogs and boggy woods and thickets, frequent in Yarmouth and southern Digby Cos.

Lemna trisulca L. Cumberland Co.: spring-pools and ditches south of Amherst. Collected by me in 1902 at Sheffield's Mills, Kings Co. and reported by Macoun from Windsor. See p. 131.

L. minor L. Cumberland Co.: pools south of Amherst. Victoria Co.: Port Bevis and Iona. Recorded by Macoun from stations from Pictou Co. to Hants Co. and collected by me in 1902 at Sheffield's Mills, Kings Co. See p. 131.

XYRIS MONTANA Ries. DIGBY CO.: wet peaty hollows in savannahs along Little River, east of Tiddville. YARMOUTH CO.: peaty sloughs and boggy barrens, many parts of Argyle. SHELBURNE CO.: damp sand-flats, Villagedale. Earlier records of *X. flexuosa* probably belong here. See pp. 99, 148, 149, 150, 161.

X. CAROLINIANA Walt. Wet sandy, gravelly or peaty borders of lakes, sloughs in boggy barrens, etc., common in Digby and Yarmouth Cos. and locally eastward at least to Halifax Co. Records of *X. bulbosa* probably belong here. See pp. 99, 104, 134, 157, 161.

JUNCUS BUFONIUS L., var. HALOPHILUS Buchenau & Fernald. YARMOUTH CO.: sandy border of salt marsh, Pubnico. QUEENS CO.: damp sand-flats, Central Port Mouton and at mouth of Broad River. See p. 158.

* J. TENUIS Willd., var. WILLIAMSII Fernald. Open grassy roadside, Tusket Falls, Yarmouth Co.

* J. DUDLEYI Wiegand. Swale at southern base of North Mountain, Middleton, Annapolis Co. See pp. 140, 170.

* J. GREENEI Oakes & Tuckerm. Sand dunes, Villagedale, Shelburne Co. See p. 150.

J. EFFUSUS L., var. COMPACTUS Lejeune & Courtois. Common throughout the province.

** J. EFFUSUS, var. **costulatus** n. var., caulibus gracilibus 0.4–1.2 m. altis basi 1.5–4 mm. diametro valde costulatis; cataphyllis basilariis chartaceis purpurascentibus vel fulvescentibus supremis griseo-stramineis basi purpurascentibus 0.5–2 dm. longis; inflorescentia laxa vel subcongesta 1–7.5 cm. diametro; sepalis petalisque subaequalibus 2.2–3 mm. longis subrigidis lanceolato-attenuatis stramineis; capsulis fulvis vel olivaceis retusis perianthium aequantibus vel eo paulo brevioribus.

Culms slender, 0.4–1.2 m. high, 1.5–4 mm. in diameter at base, strongly costulate: basal sheaths papery, purplish or reddish-brown; the upper grayish-stramineous, purplish at base, 0.5–2 dm. long: inflorescence lax or somewhat crowded, 1–7.5 cm. in diameter: sepals and petals subequal, 2.2–3 mm. long, rather rigid, lance-attenuate, stramineous: capsule reddish or olivaceous, retuse, equaling or but slightly shorter than the perianth.—Quebec, Prince Edward Island and Nova Scotia to South Carolina. The following, of many numbers examined, are characteristic. QUEBEC: vicinity of Cap à L'Aigle, August 18, 1905, *J. Macoun*, no. 68,858. PRINCE EDWARD ISLAND: fresh or slightly brackish reclaimed marshes along Hillsborough River, Mt. Stewart, July 30, 1912, *Fernald, Bartram, Long* & *St. John*, no. 7164; damp border of heath-barren, Lot 40, August 8, 1914, *Fernald* & *St. John*, no. 10,985. NOVA SCOTIA: low ground, Sydney, August 17, 1902, *Fernald;* wet sphagnous spruce bog near Louis Lake, Port Joli, August 17, 1920, *Fernald, Long* & *Linder*, no. 20,661; boggy barrens near Clement Pond, Barrington, August 9, 1920, *Fernald, Long* & *Linder*, no. 20,654 (TYPE in Gray Herb.);

spruce and red maple swamps by Trefry's Lake, Arcadia, July 29, 1920, *Fernald* & *Long*, no. 20,653. Maine: border of salt marsh, Wells, August 8, 1916, *Fernald* & *Long*, no. 13,192. New Hampshire: by brook, East Andover, August 13, 1903, *M. A. Day*. Massachusetts: swale near Zion's Hill, Winchester, July 15, 1913, *Fernald*, no. 9173; sandy shore of Clear Pond, Lakeville, August 26, 1913, *Fernald* & *Long*, no. 9180; thin sphagnous peat overlying sand, Wareham, October 2, 1913, *Fernald* & *Long*, no. 9187; small quagmire in woods south of Sparrow Young's Pond, Chatham, July 15, 1918, *Fernald*, no. 16,538; boggy swale, Orleans, July 22, 1919, *Fernald* & *Long*, no. 18,202; border of cattail marsh, South Truro, August 10, 1919, *Fernald* & *Long*, no. 18,203; along Look's Brook, West Tisbury, Martha's Vineyard, July 26, 1916, *F. C. Seymour*, no. 1146; gutters in slightly sandy soil, Worthington, August 12, 1912, *B. L. Robinson*, no. 516. Rhode Island: wet open sphagnous thickets, southwest of Harbor Pond, Block Island, August 19, 1913, *Fernald* & *Long*, nos. 9176, 9177. New Jersey: Bear Swamp, Lawrenceville Sta., Mercer Co., June 20, 1913, *Bartram*. Pennsylvania: Bush Hill Falls, Monroe Co., July 10–14, 1903, *Stone*, no. 5392. South Carolina: Florence, May 18, 1912, *Bartram*.

The coastal plain representative of the usually more northern var. *Pylaei* (Laharpe) Fernald & Wiegand, the latter plant having usually strongly costulate culms, but larger flowers (3–4.3 mm. long), with the sepals definitely exceeding the petals. In the Cape Cod region var. *costulatus* is the most abundant variety of *J. effusus* and in a letter concerning its occurrence in New Jersey Mr. E. B. Bartram wrote, under date of November 9, 1913: "When I first collected the New Jersey plant in June I was strongly impressed with the appearance it made in the field as compared with var. *solutus*. The two plants were common in the same marsh but they formed large colonies that could readily be distinguished from each other at a considerable distance. The darker colored and more compact inflorescences of the unnamed variety contrasted strongly with the lighter colored and more open inflorescences of var. *solutus*. In travelling to and from New York across the northern portion of the New Jersey coastal plain I was able to distinguish the two forms quite clearly from the train. From these observations I should say that the var. *solutus* is decidedly in the minority throughout the region between Trenton and New Brunswick. . . . We turned up the same thing in lower Delaware along the Indian River." See p. 145.

J. effusus, var. solutus Fernald & Wiegand, Rhodora, xii. 90 (1910). Common throughout the province.

* J. EFFUSUS, var. PYLAEI (Laharpe) Fernald & Wiegand, RHODORA, xii. 92 (1910). Open swampy thickets, Baddeck.

J. CANADENSIS J. Gay. Abundant in wet sandy or peaty soils, Yarmouth Co. to Annapolis and Queens Cos.

** J. CANADENSIS J. Gay, var. **sparsiflorus**, n. var., dense cespitosus robustus 6–8 dm. altus; inflorescentiis 0.7–2 dm. longis, ramis erectis vel valde adscendentibus rigidis; capitulis discretis plerumque 3–7-floris; perianthiis 3.5–4 mm. longis.

Densely cespitose, robust, 6–8 dm. high: inflorescences 0.7–2 dm. long, with erect or strongly ascending rigid branches: heads scattered, mostly 2–7-flowered: perianths 3.5–4 mm. long.—NOVA SCOTIA: boggy savannah bordering Butler's (Gavelton) Lake, September 2, 1920, *Fernald & Long*, no. 20,685, September 4, *Fernald, Long & Linder*, no. 20,686 (TYPE in Gray Herb.); boggy savannah bordering St. John Lake, Springhaven, October 8, 1920, *Fernald & Linder*, no. 20,687. MASSACHUSETTS: sandy and peaty margin of pond between Grassy and Lower Simmons Ponds, Dennis, August 22, 1918, *Fernald & Long*, no. 16,549. See p. 166.

In typical *J. canadensis* the branches are less erect, the flowers very numerous in the glomerules and the perianths 2.5—rarely 3.5 mm. long.

** J. SUBCAUDATUS (Engelm.) Coville & Blake, var. **planisepalus**, n. var., a forma typica differt perianthiis 2–3 mm. longis; sepalis petalisque lanceolatis planis dorso viridibus; capsulis maturis valde exsertis.

Differing from the typical southern form in having the perianth 2–3 mm. long: sepals and petals lanceolate, flat and green on the back: mature capsule conspicuously exserted.—Savannahs, bogs and spruce swamps of Nova Scotia. DIGBY Co.: thickets bordering savannahs by Little River, east of Tiddville, August 22, 1920, *Fernald & Long*, no. 20,671 (TYPE in Gray Herb.). YARMOUTH Co.: sphagnous bog at edge of spruce swamp, Belleville, July 27, *Long & Linder*, no. 20,665; springy sphagnous spot at border of spruce woods near Randel Lake, Argyle, August 4, *Long & Linder*, no. 20,666; sphagnous swales bordering Salmon (Greenville) Lake, August 13, *Fernald, Bissell, Graves, Long & Linder*, no. 20,668; open grassy roadside, Tusket Falls, August 20, *Fernald, Bissell, Graves, Long & Linder*, no. 20,670; spruce and alder swamp, Pembroke Shore, October 6, *Fernald & Linder*, no. 20,723; boggy margin, East Branch of Tusket River, Quinan, October 8, *Fernald & Linder*, no. 20,672. SHELBURNE Co.: spruce swamp, Villagedale, August 7, *Fernald, Long & Linder*, no. 20,667. QUEENS Co.: springy sphagnous bog in spruce woods near mouth of Broad River, August 16, *Fernald & Bissell*, no. 20,669.

In the southern form of the species the perianths are 3–4 mm. long; the sepals and petals lance-linear and conspicuously ribbed or corrugated and the capsule commonly but little exserted. Some speci-

mens from southeastern Connecticut seem to be transitional. See pp. 142, 149, 156, 158.

J. PELOCARPUS Meyer. Although not recognized in Macoun's *Catalogue*, *J. pelocarpus* is characteristic of wet sandy shores throughout Nova Scotia.

J. MILITARIS Bigel. Typical of sandy and peaty lake-margins throughout the silicious regions of the province.

* J. ACUMINATUS Michx. Local in YARMOUTH Co.: clayey roadside ditch, Yarmouth; springy ditches near Trefry's Lake, Arcadia; sandy and muddy tidal flats of Tusket River, Tusket Falls; springy ditches and wet roadsides, Abram River. Included in Lindsay's Catalogue, but apparently through error of determination. See pp. 105, 142.

J. ARTICULATUS L., var. OBTUSATUS Engelm. Common especially in brackish soil where it largely replaces the typical form of the species. See p. 142.

J. ARTICULATUS × BREVICAUDATUS. Abundant in peaty swales at Yarmouth. Less abundant on savannah near Tiddville, Digby Co. See p. 152.

J. ARTICULATUS × CANADENSIS. Dryish sphagnous swale, Tiddville, Digby Co.; sphagnous swale, Lower Argyle, Yarmouth Co.

J. ARTICULATUS × NODOSUS. Sterile plants with *J. articulatus* L. and *J. nodosus* L. in a brackish swale at Baddeck (*Fernald & Long*, nos. 20,721 and 20,722) seem to be of this origin.

J. MARGINATUS Rostk. Local in YARMOUTH Co.: springy ditches and wet roadsides, Abram River; wet clayey brookside, Argyle Head. Reported by Lindsay as collected by Sommers at Halifax. See pp. 142, 149.

* *Ornithogalum umbellatum* L. Thoroughly naturalized with *Leucojum aestivum* and considered a troublesome weed in an old field, Yarmouth.

SMILACINA RACEMOSA (L.) Desf. Not seen southwest of Annapolis Co.

STREPTOPUS AMPLEXIFOLIUS (L.) DC. Not seen in the southwestern counties.

POLYGONATUM BIFLORUM (Walt.) Ell. Not seen in Yarmouth and Shelburne Cos

Convallaria majalis L. Somewhat established in woods near Yarmouth. See p. 95.

TRILLIUM ERECTUM L. Not seen west of Annapolis Co. See p. 140.

T. CERNUUM L. Not seen in the southwestern counties where *T. undulatum* Willd. is common.

SMILAX ROTUNDIFOLIA L. Thickets bordering lakes and rivers, frequent in Digby and Yarmouth Cos.; also seen along Sable River, Shelburne Co. See pp. 109, 145, 147.

** S. ROTUNDIFOLIA, var. QUADRANGULARIS (Muhl.) Wood. Frequent with the typical form or in separate colonies, Yarmouth Co. See pp. 144, 147.

LOPHIOLA **septentrionalis**, n. sp. Planta stolonifera caulibus solitariis vel laxe cespitosis 4–5.5 dm. altis; foliis linearibus imis usque 3 dm. longis 1.5–3.5 mm. latis plerumque 8-nerviis margine hyalinis basi deinde fulvis; inflorescentiis laxis paniculato-corymbiformibus 0.6–1.8 dm. altis 0.6–1.2 dm. latis, rhachi ramibusque imis valde adscendentibus sparse villosis vel glabratis, pedicellis adscendentibus albido-tomentosis plerumque 0.7–1.5 cm. longis; bracteis oblongo-lanceolatis scariosis fulvis; perianthiis 1.2–1.5 cm. diametro, segmentis patentibus vel reflexis lanceolatis subtus villoso-tomentosis supra fulvis apice glabris basi medioque longe villoso-barbatis pilis aureis deinde flavescentibus; filamentis 3 mm. longis, antheris oblongis 1.2 mm. longis; capsulis rufescentibus vel fulvis conico-ovoideis rostratis fere basi liberis 4–4.5 mm. longis 3 mm. latis; seminibus fusiformi-obovatis vel clavatis vel semi-obovatis stramineis longitudinaliter obscure corrugatis 1–1.4 mm. longis apice rotundatis brunneo-tinctis basi plerumque caudatis.

Plant stoloniferous; the stems solitary or loosely cespitose (often with 2 or 3 flowering stems and many crowded leafy tufts), 4–5.5 dm. high: leaves linear; the lower up to 3 dm. long, 1.5–3.5 mm. wide, mostly 8-nerved, hyaline at margin, finally fulvous at base: inflorescences lax, paniculate-corymbiform, 0.5–1.8 dm. high, 0.6–1.2 dm. broad, the rhachis and strongly ascending lower branches sparingly villous or glabrate; the ascending pedicels white-tomentose, mostly 0.7–1.5 cm. long: bracts oblong-lanceolate, scarious, fulvous: perianths 1.2–1.5 cm. in diameter; the segments spreading or reflexed, lanceolate, villous-tomentous beneath, fulvous above and glabrous at tip but with the basal half or two-thirds villous-bearded with golden or finally only yellowish long crinkled hairs: filaments 3 mm. long; anthers oblong, 1.2 mm. long: capsules reddish or fulvous, conic-ovoid, beaked, free almost to the base, 4–4.5 mm. long (including the beak), 3 mm. broad: seeds fusiform-obovate, clavate or semi-ovate, straw-colored, longitudinally but obscurely corrugated, 1–1.4 mm. long, rounded and brown-tinged at apex, usually tailed at base. —NOVA SCOTIA: wet savannahs along Little River east of Tiddville, Digby Co., August 22, 1920, *Fernald* & *Long*, no. 20,784 (TYPE in Gray Herb.), October 13, 1920, *R. W. Sypher*, no. 20,785.

Differing from both *L. aurea* Ker, which extends from Mississippi to Florida and locally to South Carolina, and *L. americana* (Pursh) Wood of the New Jersey pine-barrens in its fulvous capsule free nearly to base and in its caudate-based seeds, both the more southern species having the green capsules adnate at least half their length to the perianth and the seeds rounded at both ends. *L. aurea* has

much coarser leaves, commonly 5–8 mm. wide with 10-14 nerves; very many more flowers on shorter pedicels, and smaller perianth with narrowly oblong segments with the shorter beard only at base. *L. americana* is usually lower and the splendid representation generously loaned me by the New York Botanical Garden, Academy of Natural Sciences of Philadelphia, United States National Museum and Missouri Botanical Garden shows no tendency to the cespitose or subcespitose habit of *L. septentrionalis*. *L. americana*, furthermore, has the much denser inflorescences heavily tomentose and with short pedicels. See further discussion on pp. 160–163, 168.

** *Leucojum aestivum* L. The Summer Snowflake of gardens is thoroughly naturalized with *Ornithogalum umbellatum* and considered a troublesome weed in an old field at Yarmouth.

"Thoroughly and abundantly established . . . in a brook whence it is rapidly spreading, Brunswick," Maine,—now established for about 40 years.—See Fernald, Proc. Portl. Soc. Nat. Hist. ii. 133 (1897).

Iris setosa Pall., var. canadensis Foster. Apparently not common west of Cape Breton. Guysborough Co.: Canso, *Fowler*. Queens Co.: upper border of the beach, Central Port Mouton. Annapolis Co.: crests of basalt cliffs by Bay of Fundy, Margaretville. See p. 139.

Iris pseudacorus L. Well naturalized about pools and ditches, Yarmouth. See p. 95.

Sisyrinchium gramineum Curtis. Common in damp grassy, peaty or gravelly open places, Yarmouth Co. to Halifax Co. See pp. 95, 134, 147.

** S. atlanticum Bicknell. Common in damp peaty, sandy or gravelly soil, Yarmouth Co. to Queens Co. See pp. 95, 99.

** S. arenicola Bicknell. Yarmouth Co.: dry sandy bank, Yarmouth. Annapolis Co.: damp *Polytrichum*-covered sandy plains, Middleton. See pp. 96, 138.

Habenaria viridis (L.) R. Br., var. bracteata (Muhl.) Gray. *H. bracteata* (Muhl.) R. Br. Rich woods, Folleigh, Colchester Co. See p. 136.

** H. flava (L.) Spreng. Yarmouth Co.: peaty and cobbly beach of Salmon (Greenville) Lake; wet peaty margin of Butler's (Gavelton) L., Gavelton; gravelly margin of Tusket (Vaughan) L.; sandy and cobbly beach of Fanning Lake, Carleton. Not known nearer than Trenton, New Jersey (see pp. 147, 148, 160, 168). The planst of eastern Nova Scotia (Boylston, *C. A. Hamilton*) is var. virecens (Muhl.) Fernald, p. 148.

H. hyperborea (L.) R. Br. Not seen west of Annapolis and Queens Cos.

H. OBTUSATA (Pursh) Richards. Not seen west of Colchester and Queens Cos.

H. HOOKERI Torr. Not seen west of Queens Co.

H. MACROPHYLLA Goldie. COLCHESTER CO.: rich woods, Folleigh. CAPE BRETON CO.: mixed woods, North Sydney. See p. 136.

H. BLEPHARIGLOTTIS (Willd.) Torr. Abundant on boggy barrens and even in dryish barrens and spruce thickets, Yarmouth Co.; seen only in peat overlying the gold-bearing series in southern Shelburne and Queens Cos. and not observed on the granitic areas. See pp. 90, 110, 142, 148, 157.

** POGONIA OPHIOGLOSSOIDES (L.) Ker, var. **brachypogon**, n. var., barba labii obsolescente; segmentis perianthii vix divergentibus; planta plerumque subcespitosa.

Beard of the lip obsolescent, represented by short knobs: segments of the perianth scarcely divergent: plant usually subcespitose.—NOVA SCOTIA: forming dense colonies, sandy and gravelly beach of Cedar Lake, Yarmouth Co., July 11, 1920, *Fernald, Bissell, Pease, Long* & *Linder*, no. 20,888 (TYPE in Gray Herb.); Cedar Lake, Digby Co., July 25, *Fernald, Bean* & *White*, no. 20,889; dryish upper cobbly beach of Jassy Lake, Lake Annis, July 29, *Bean, White* & *Linder*, no. 20,891; wet sandy and peaty pockets in cobble-beach of Trefry's Lake, Arcadia, July 29, *Fernald* & *Long*, no. 20,892.

Other material from Trefry's Lake (no. 20,881) and from Clearwater Lake, Belleville (no. 20,890) is transitional to the typical form of the plant with long beard on the lip. Some specimens from Newfoundland and the Magdalen Islands are also transitional. For further discussion see pp. 102, 140.

** CALOPOGON PULCHELLUS (Sw.) R. Br., forma **albiflorus** (Britton), n. comb. *C. tuberosus*, forma *albiflorus* Britton, Bull. Torr. Bot. Cl. xvii. 125 (1890). YARMOUTH CO.: a single plant, sandy and peaty margin of Lake Annis.

For note on generic and specific names see p. 132.

SPIRANTHES CERNUA (L.) Richard. Boggy meadows and clearings and sandy shores, Yarmouth Co. to Halifax Co.

** S. CERNUA, var. OCHROLEUCA (Rydb.) Ames. YARMOUTH CO.: sandy fields and dry rocky barrens, Pubnico. See p. 167.

LIPARIS LOESELII (L.) Richard. Occasional in peaty meadows and peaty and cobbly lake-shores, Yarmouth and Digby Cos. See p. 141.

SALIX CORDATA Muhl. Not seen in Yarmouth, Shelburne, and Queens Cos., nor in southwestern Digby Co.

S. PYRIFOLIA Anderss. *S. balsamifera* Barratt. Swampy thickets throughout the province.

(*To be continued.*)

Lathyrus Nissolia, a recent Introduction in the State of Washington:—Early in May I observed on the Western slope of the dry hillside leading to the campus of the State College of Washington, Pullman, what appeared to be a grass, different from that commonly grown in this section. The shade of green was distinctly more vivid than that of the other plants by which it was surrounded. Several times during the month of May this spot was visited and attention was attracted to the rapid and very vigorous growth which this little plant was making. On June 6th, 1921, the first brilliant, crimson, papilionaceous flowers appeared and at the end of three weeks the plants were blooming in great profusion. In this new garb the grass-like appearance of the plant was altered by the bright flowers which showed it to be a member of the *Leguminosae*.

A single plant carelessly removed from the very shallow soil, where it was growing so well, revealed thickly noduled rootlets. In the immediate vicinity there was growing very sparsely *Lathyrus Sandbergii* Howell. This was also in flower. The resemblance between the two was so great that the attempt was made to identify the former by aid of Piper and Beattie's Flora of Southeastern Washington and Adjacent Idaho, as a member of the same genus. No description in this flora covered this legume. The specimen was then given to Dr. Harold St. John, Professor of Botany in the State College of Washington, who identified it as *Lathyrus Nissolia* L.

An effort to account for the presence of this little pea growing in Pullman has resulted in failure. There is no record of this species ever having been planted here and a search through the literature fails to reveal any record of its introduction in North America. Pressed specimens have been placed in the herbarium of the State College of Washington and the Gray Herbarium, Cambridge, Mass.—Charles S. Parker, Pullman, Washington.

Vol. 23, no. 272, including pages 181 to 200, was issued 15 December, 1921.

The date of no. 273, still in press, will be announced later.

Rhodora

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Rhodora

JOURNAL OF

THE NEW ENGLAND BOTANICAL CLUB

Vol. 23. November, 1921. No. 275.

GRAY PINE AND ARBOR-VITAE.

Arthur Stanley Pease.

In an interesting article in Rhodora, xxi. 41–67 (1919), Professor Fernald has stated that *Pinus Banksiana* is confined to acid soils, *Thuja occidentalis* chiefly to basic soils, reaching its maximum development and its outlying stations only in positively calcareous areas. A railway trip taken in June, 1921, in a region not very well known botanically, gave the writer an opportunity to make from the car windows some observations upon these two conspicuous species, and his notes may be worth concise presentation as evidence supplementary to that offered by Professor Fernald.

Across the southern part of the upper peninsula of Michigan, from Gladstone to Manistique, barrens with *Pinus Banksiana* (and scattered *Pinus resinosa*) were seen, but there was no *Thuja* near these species. Along the line of the Algoma Central and Hudson Bay Railway, from Sault Ste. Marie, Ont., northward for nearly three hundred miles I made the following notes, the mileages given being those from Sault Ste. Marie. Near Frater (mile 102) Gray Pine was reported to me by an old resident as being very scarce; he had seen but two trees of it in an experience of many years. Near O'Connor (mile 126) the first trees of the species visible from the railroad began to appear; beyond Agawa (mile 131) they became common, continuing near Tabor (mile 141), and largely found as a second growth after fires. Beyond Limer (mile 156) there are barrens with *Vaccinium pennsylvanicum* and its var. *nigrum* and Gray Pine. During all these observations of Gray Pine which I have mentioned no *Thuja* was seen anywhere in the neighborhood. Near Hawk Jc. (mile 165), however, both are found,

Thuja in bogs, *Pinus Banksiana* on dry ridges, sometimes not more than two hundred feet from the *Thuja*, and north of Alden (mile 173) the two were seen within twenty-five feet of one another, but it was noteworthy that the cedars were on a shore, close to water, and the pine on a gravelly ridge. Beyond Dreany (mile 182) the pine descends into bogs, in company with *Larix*, but the character of the soil in these is betrayed by the abundant presence of *Ledum groenlandicum* and no *Thuja* was seen in them. A little farther north the pine forms thick stands upon the drier ground, but soon after disappears. Between Franz (mile 195) and Hearst (mile 296) there are large calcareous areas, for example at Gray (mile 229) and Akron (mile 233), with such characteristic plants as *Valeriana uliginosa* and *Lonicera involucrata* and, of course, *Thuja*, and along this stretch, as well as from Hearst eastward for one hundred and thirty miles to Cochrane, I saw no Gray Pine. East of Cochrane, however, on the line of the National Transcontinental Railway, I was able to make some further observations (the mileages being this time those from Quebec). East of Norembega (mile 559) the first Gray Pine appeared, and near Lake Abitibi (about mile 531) young trees of it grew infrequently by the railroad track, as though adventive. *Thuja* was also seen, but in bogs, and the two were not seen together. East of Balkam (about mile 515) was Gray Pine unaccompanied by *Thuja*; east of Authier (mile 470) it was found in company with much *Kalmia angustifolia*; about Amos (mile 433) it was abundant, but always without cedars. Its presence or absence in a distance of two hundred miles which I passed after dark I cannot describe, but the next day I saw it near Ferguson (mile 181), and near La Tuque (mile 129) it and *Pinus resinosa* were seen on ridges, with *Thuja* in low swampy ground.

Naturally these observations lose much of their value without the control of careful soil tests, which in a trip of this sort were obviously impossible. Yet it may be safely be stated, so far as my observations go, that whenever *Pinus Banksiana* and *Thuja* were both present at one locality there was visible, even at a hasty glance from the train, some decided difference in their habitats. That this difference, as I have described it at Hawk Jc. and Alden, depended upon something more than a mere question of moisture may also be inferred from the fact that the pine was by no means limited to dry ridges, as the station which I have described near Dreany well showed. *Pinus Banksiana* will apparently grow either upon dry sandy (or rocky) barrens or in wet

peat bogs, but not in the soil conditions necessary for *Thuja*, and *Thuja*, as Professor Fernald well remarks in his article, will grow in habitats either boggy or well drained, but not in the soil conditions, whatever these may be, required by *Pinus Banksiana*. To this extent, then, my observations appear to corroborate the conclusions of Professor Fernald.

Urbana, Illinois.

NOTES FROM THE WOODS HOLE LABORATORY,—1921.

I. F. Lewis and W. R. Taylor.

(Plate 133)

Platymonas subcordiformis (Wille) Hazen.—In the summer of 1917 a unicellular green organism was found in a small tide pool on Black Rock, near the entrance to New Bedford Harbor. It was considered to be a new American species of the genus *Platymonas* West[1] until Dr. Tracy E. Hazen established and called attention to the fact that it is identical with Wille's *Carteria subcordiformis*.[2] Dr. Hazen's account is reproduced at the end of this note.

The organism has been found in each succeeding summer in the same locality, and Dr. Hazen records its occurrence elsewhere in Massachusetts and in New York, as well as in England and Norway. At the Black Rock station it has been consistently abundant in certain pools. The rock is a haunt of gulls, and the water containing the *Platymonas* is at times so fouled with excrement as to give off a decidedly unpleasant odor. It seems, like certain other Chlamydomonads, to flourish best in the presence of organic pollution. It can endure a range of salinity from that of almost fresh, or quite fresh (Wille), water to that of sea water.

The cells are small, varying in length from 13 to 17 μ, in breadth from 7 to 8 μ, in thickness from 4 to 5 μ. In surface view (pl. 133, figs. 1–3) the cells are oval and flattened. One face is convex, while the other is nearly flat (fig. 4).

The usual vegetative phase is actively motile with the anterior end

[1] West, G. S. Algological notes XVIII–XXIII. Journal of Botany **54**: 1–10. 1916.
[2] Wille, N. Algologische Notizen IX. Ueber eine Art der Gattung *Carteria* Diesing. Nyt. Mag. Naturvid. **41**: 89–94, Taf. 3. 1903.

directed forward. There are four cilia, which are inserted close together in a pit on the anterior end. One lip of the pit is higher than the other. A large stigma occurs in the posterior third of the cell and on its flat face. The chloroplast is single and is usually cup-shaped or sometimes cylindrical. At times it is seen to be two or four lobed anteriorly, but posterior lobes similar to those of *P. tetrathele* West were not observed. The four mammillate anterior projections of the cell of *tetrathele* are also usually lacking, though in cells which have ceased to move the end view may sometimes be quadrate.

The pyrenoid in face view is cup-shaped, though it seems spherical when viewed from the side. Starch grains are found around the pyrenoid and at times elsewhere within the chloroplast. The single nucleus occurs in the cavity of the chloroplast.

The cell wall is a delicate membrane of cellulose, visible with difficulty in the motile cell, though easily observed in fixed material or in reproducing individuals.

Reproduction (figs. 5–19) is exclusively asexual. A vegetative cell loses its cilia and the contents divide into two by constriction. Division may be either longitudinal, oblique, or transverse. The first indication of division is an increase in the size of the cell followed by the splitting of the chloroplast. The stigma then divides unequally, the two parts soon separating. After this the protoplast divides and last the pyrenoid. The peculiar shape of the pyrenoid seems to be due to its mode of division. Fission into equal halves takes place, from which result two shallow cups. The edge of each cup grows upward and inward as if to form a hollow sphere, but the process is incomplete and a deep cup with a narrow opening results.

In its structure and mode of division *Platymonas subcordiformis* shows a remarkably close resemblance to the zoospores of *Prasinocladus subsalsa* (Davis) Wille. The resemblance is so striking as to amount almost to identity. It would be difficult to distinguish between the two if they were mounted in the same drop. The size, the thin membrane-like wall, the four cilia of the same length as the cell, the conspicuous stigma, the plane of division varying from longitudinal to oblique or transverse, the peculiar cup-shaped pyrenoid are all identical. The zoospore of *Prasinocladus* has not been described as flattened, but this point is not easily observed and may have been overlooked as it was when Wille described *Carteria subcordiformis*.

The chloroplast may be either lobed or a continuous cylinder in both forms. Furthermore, bothare catharobic, requiring organic adjuvants to the brackish water in which they live. There are two notable differences. First, *Prasinocladus* has been found only in late fall or winter in this locality, while *Platymonas* has been observed only in summer. Second, *Platymonas* is free swimming, while the cells of *Prasinocladus* are united to form a gelatinous colony.

There is here a problem still to be solved, but to the writer the probabilities strongly favor the view that *Platymonas* is the motile stage, *Prasinocladus* the "Palmella" stage of the same organism.

Opposed to this view is the negative result of culture. *Platymonas* was isolated on agar and kept for over twelve months under continuous observation. Samples were removed and cultivated in sea water under varying conditions. The unicellular condition was persistently maintained and the pseudofilamentous habit of *Prasinocladus* was never assumed. Observations under natural conditions will be required before a final judgment can be given.—I. F. Lewis.

Platymonas **subcordiformis** (Wille) Hazen, comb. nov. *Carteria subcordiformis* Wille, Nyt. Mag. f. Naturvid. **41**: 93, 94. 1903. It may be worth while to record briefly the history of this species. During a visit to Woods Hole in August 1919 Dr. Lewis conducted me to his station for *Platymonas* at Black Rock, where abundant material was secured. Later in the season I found the same species in less amount at Twin Island, Pelham Bay, New York. Early in the summer of 1920, while spending a week at Aalesund, Norway, where Professor Wille had discovered several interesting Chlamydomonads in 1902, I collected a form which was at once recognized as very similar to, if not identical with, that to which Dr. Lewis had introduced me. I was also struck with the resemblance of this form to *Carteria subcordiformis*, especially when comparison was made with the original drawings of the latter a few days later. Upon examination of my freshly collected material, Professor Wille readily identified it with his species, which appears not to have been reported since the original discovery. I later found the same species at Cullercoats, near Newcastle-upon-Tyne, and at Plymouth, England. In September 1920 I again collected the species at Nahant, Mass., and also at Fort Phoenix, Fair Haven, Mass., not far distant from the station on Black Rock, and again at Pelham Bay. I have

had living material from these four stations and from the three European stations for simultaneous examination, and after careful study am convinced that it all belongs to one species I had hoped to find at Plymouth the type species, *Platymonas tetrathele* West, but I could only discover there *P. subcordiformis* and a new species, quite different from either, which I had also found at Aalesund.

It may appear strange that the compressed form of the cell, which is the chief character upon which this species is to be placed in the genus *Platymonas* rather than in *Carteria*, was overlooked by Wille. But at certain times the narrower diameter of the cells is so little presented to view as to be very inconspicuous. My own first impression was that this species exhibited hardly sufficient differences to warrant its removal from the genus *Carteria*, but extended observation during more than a year has convinced me that it is very distinct, and that it is very desirable to maintain the genus *Platymonas* West. Wille has also recorded *Carteria subcordiformis* as a freshwater species, while in all the seven stations where I have collected it the water has been brackish; but in these small rock hollows on the shore the salinity of the water undoubtedly varies considerably. I have found that cells may be transferred successfully to fresh water or to clean sea water.—TRACY E. HAZEN.

ASTEROCOCCUS SUPERBUS (Cienk.) Scherf.—This beautiful member of the Protococcales was found in abundance in 1920 and 1921 among sphagnum along the shores of Sheep Pond, Cuttyhunk Island. This is its first recorded occurrence for North America, though Smith[1] has found *Asterococcus limneticus* in Wisconsin.

The method of escape of the spores, not hitherto noted, is indicated in fig. 26. The lamellae at a point opposite the clear spot which is the point of origin of the cilia soften and swell, finally dissolving. The outermost layer is first involved, then the others progressively until the spore is free to escape.—I. F. LEWIS.

ANABAENA SPIROIDES VAR. CRASSA LEMM.—On July 30, 1920, the writer noted a considerable "bloom" on North Head of Hummock Pond, Nantucket, Massachusetts. This on examination proved to be a mixture of *Clathrocystis aeruginosa* (Kütz) Henfr., and an *Anabaena* notable for the regularity of its spiral trichome, and for having round

[1] Smith, G. M. Phytoplankton of the inland lakes of Wisconsin. Madison. 1920.

spores. Considerable material was obtained by the kindness of Dr. Alice M. Russell, and some was sent to Dr. Gilbert M. Smith, who identified the form as *Anabaena spiroides* var. *crassa* Lemm., noting

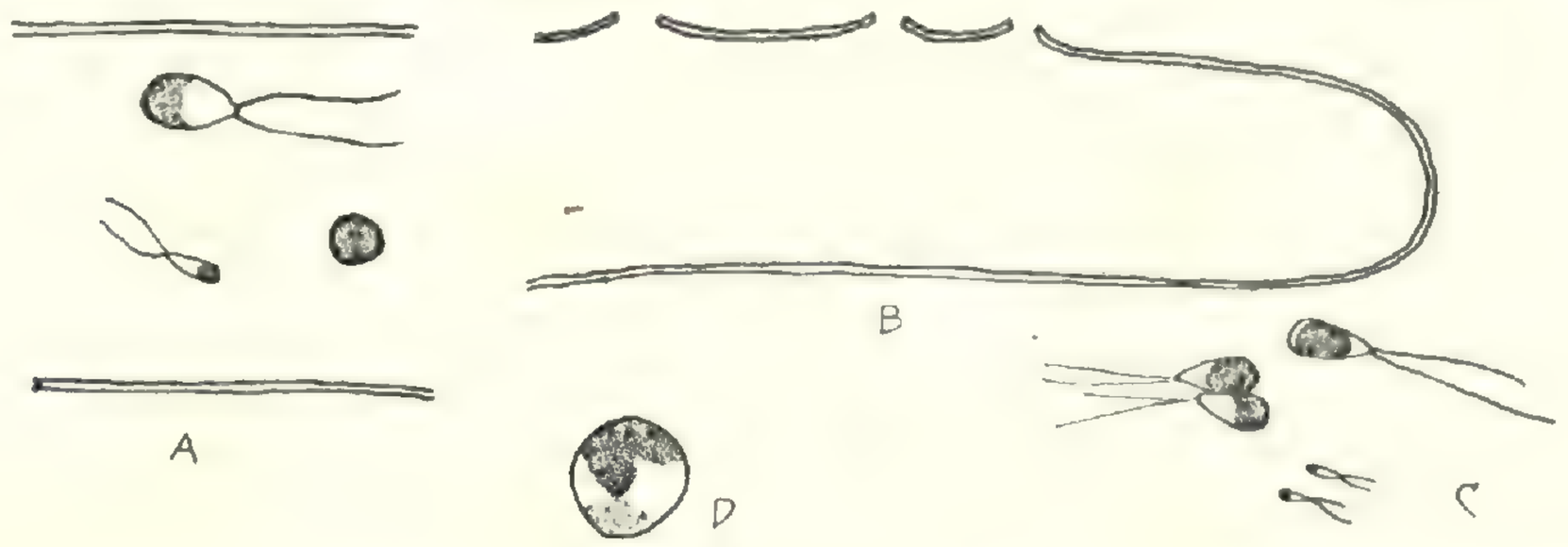

FIG. 1. *Anateana spiroides* var. *crassa*. A, Trichome showing three heterocysts but no spores. ×300. B, C, D, Portions of trichome showing spores and heterocyst. × 650.

however that the spores of the Nantucket material are round, whereas those of this variety of *Anabaena spiroides* are typically elongate. The measurements of the Nantucket form are: trichome 11.5μ average diameter, heterocysts 13μ diameter, and spores thick and smooth-walled, diameter 22μ. Dr. Smith has reported *Anabaena spiroides* var. *crassa* as occurring in Wisconsin lakes.—W. R. TAYLOR.

Mougeotia tenuis (Cleve) Wittrock. This distinct form was found with zygospores in a small pond on Pasque Island July 6, 1921.

Mougeotia parvula Hassall. Abundant material of this species in all stages of conjugation appeared in a drinking fountain in Woods Hole, July 1921.

BRYOPSIS HYPNOIDES Lamx.—In a specimen of *Bryopsis hypnoides* Lamx., collected from a float in the harbor near the laboratory, a great many of the branches were found to contain gametes. All of the protoplasm of the branch goes into the formation of the gametes, which escape through several pores in the cell walls. The passage out was moderately rapid. On the slide under the microscope, the female gametes soon settle down and become motionless, whether fertilization occurs or not. The males are more active, settling down later. Some branches contained both male and female gametes. In such cases the number of female gametes is greater. Other branches apparently produce only one kind.

The male gametes are very small and biciliate, the cilia being of equal or possibly subequal length. The chloroplast is massed in the

posterior part of the cell and is slightly orange in color, the rest of the cell being colorless. Cilia are directed forward in swimming.

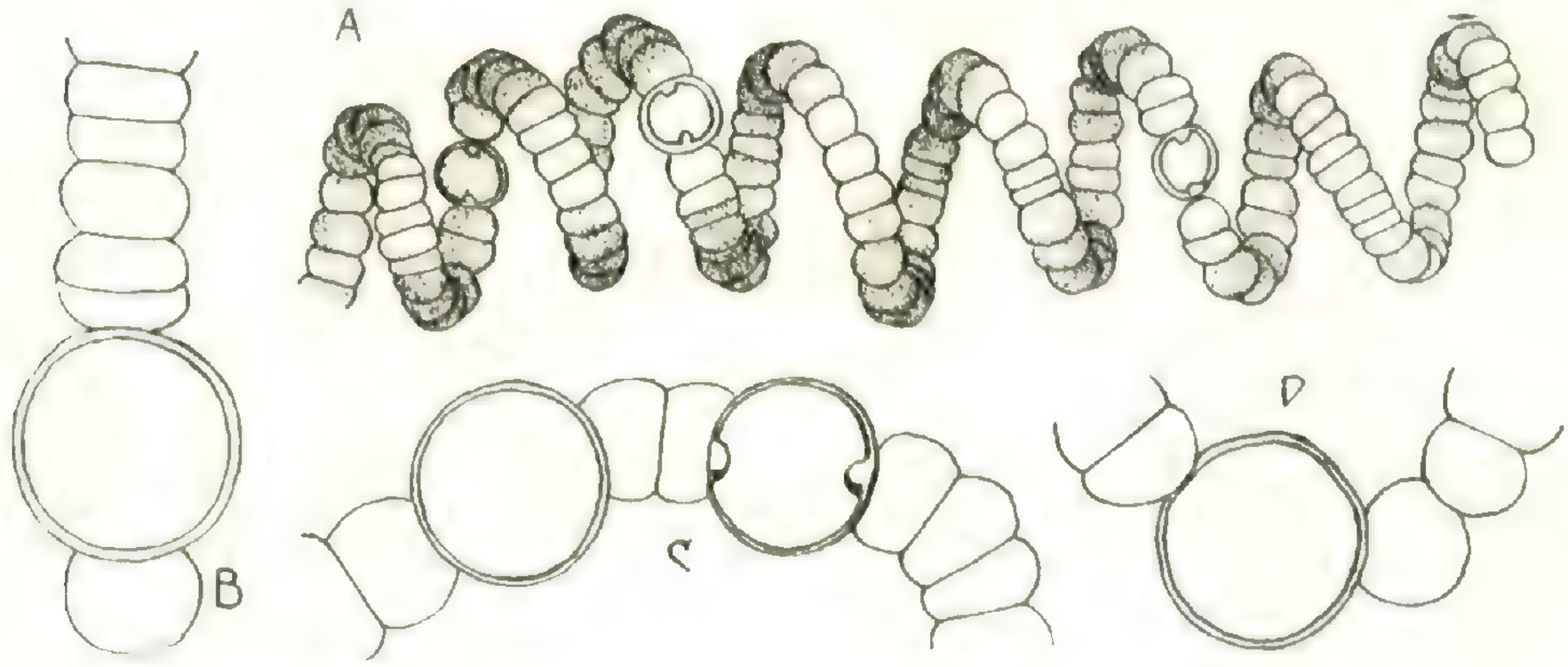

FIG. 2. *Bryopsis hypnoides.* × 650. A, Male and female gametes in portion of branch. B, Exit pores in side of branch. C. Male and female gametes. D. Germinating zygote.

The female gametes are more egg-shaped and much larger than the males. In structure they are similar save for a slight yellowish cast to the chloroplast.

On fusion the pair settle down and zygotes of irregular shape are formed, which show some metabolic movements.

The phenomena of germination were not observed except for an increase in the size of the zygote.

The Bryopsidaceae are prevailingly dioecious, so that the monoecism observed in *Bryopsis hypnoides* is exceptional in the family. The length of the cilia is also exceptional in this species. It varies from slightly longer than, to more than twice as long as, the cell.—J. B. LACKEY.

ECTOCARPUS MITCHELLAE HARV. VAR. **parva** N. VAR. Thallus caespitose, attached, 8–12 mm. tall. Interlacing decumbent basal filaments giving rise to the primary erect filaments (of 22 μ average diameter) seldom branched. The few lateral secondary branches scattered, largely on the distal half of the primary, with average diameter 16 μ at the base, and produced into short hairlike tips. Plurilocular sporangia sessile, erect on the upper side of the secondary branches, cylindrical, obtuse, composed of a few large cells each producing one round or slightly oval motionless megaspore. Sporangia average 60 μ long by 16 μ broad, and spores 12 μ in diameter.

During the last week of July, 1919, the collectors of the U. S. Fish-

eries Commission brought into the laboratory at Woods Hole, Massachusetts, a specimen of the Loggerhead Turtle, *Thalassochelys caretta* from Vineyard Sound. Tufts of an alga on the carapace were referred to the writer for study. He is much indebted to the late Mr. F. S. Collins for helpful suggestions with regard to its relationships.

The form was found to be closely related to *Ectocarpus Mitchellae* Harv. (*E. virescens* Thuret) as indicated by its sporangial characters and certain striking features of its vegetative habit. It differs mainly in having the primary erect filaments sub-simple, not abundantly branched, and in the smaller size of the vegetative filaments and the sporangia. The fresh material showed abundant stages in the development of the sporangia, the extrusion of the spores and their germination and growth. The decumbent filaments produced lobed haptera, and the cells of the erect filaments occasionally sent out corticating down-growths which sometimes reached to the substratum. The filaments and branches have a limited apical growth soon succeeded by intercalary growth from near the base. In all these growth characters it resembles *E. virescens* Thuret as described by Sauvageau (Jour. de Bot. Vol. 10, 1896). The non-motile spores showed a very distinct wall, and no evidence could be found that they had the power of movement at any time.

On July 19th, 1921, Dr. I. F. Lewis collected tufts of a brown alga from a piece of timber washed ashore on the island of Cuttyhunk, Massachusetts, which on examination proved to be the same variety as that obtained two years before. This material also showed abundant sporangia and sporelings and was in more luxuriant condition than the first lot. The fact that both collections of the alga were from drifted objects makes it impossible to tell the source of the material, but the unworn appearance of the timber would seem to indicate that it had not travelled very far and that this *Ectocarpus* might be expected along the eastern seaboard at no great distance south of Cape Cod.—W. R. Taylor.

Baptisia bracteata (Muhl.) Ell. is listed in the floras as having a western distribution, coming east only to Michigan. About the end of July 1919 one of the botanical students at the Marine Biological Laboratory brought in to the department a specimen which proved to be this plant. Investigation showed that it had appeared along the

railroad north of Woods Hole, between there and Falmouth. It seems probable that it was a quite recent introduction and the vigor of the plants and the large racemes of hairy pods seemed to point to its establishment in this neighborhood, but the present season shows none of the original colony remaining.

Search in the Herbarium of the University of Pennsylvania produced no specimen from the East, and in that of the Philadelphia Academy of Natural Sciences material from the Southern States and one specimen from Illinois were the nearest records. An inquiry at the Gray Herbarium at Harvard University brought the information that the nearest localities which they had represented were Illinois and South Carolina, and the New York Botanical Garden reported nothing from the Central Atlantic or New England States. As there seems to be no published record of this plant from New England, this locality then supported the most northeasterly colony of the species yet reported.

Specimens showing immature pods have been placed in the Herbaria of the Marine Biological Laboratory and the University of Pennsylvania.—W. R. Taylor.

Explanation of Plate 133

Figs. 1–19, *Platymonas subcordiformis.* × 800.
Figs. 1–3, Vegetative cells, face view.
Fig. 4, Side view.
Figs. 5–7, Stages in cell division.
Figs. 8–17, Longitudinal and oblique divisions.
Fig. 18, Longitudinal division, end view showing lobed chloroplast.
Fig. 19, Transverse division.
Figs. 20–24, *Ectocarpus Mitchellae* var. *parva.*
Fig. 20, Spores from living material showing chromatophores. × 730.
Fig. 21, Vegetative cell from primary filament. × 730.
Fig. 22, Main filament and branch with sporangia and sporelings. ×235.
Fig. 23, Branch showing mature sporangium discharging spores, × 235.
Fig. 24, Main filament and branches with maturing sporangia. × 235.
Fig. 25, *Asterococcus superbus*, vegetative colony. × 365.
Fig. 26, *Asterococcus* zoospore, showing mode of release. × 365.

THE GRAY HERBARIUM EXPEDITION TO NOVA SCOTIA, 1920.

M. L. Fernald.

(*Continued from p. 247.*)

S. SERICEA Marsh. Apparently rare in western Nova Scotia. YARMOUTH Co.: sandy and cobbly beach of Fanning Lake, Carleton.

* S. ROSTRATA Richardson, var. CAPREIFOLIA Fernald, RHODORA, xvi. 177 (1914). DIGBY Co.: small trees in woods and thickets at margin of Lily Lake, Sandy Cove.

** S. HUMILIS Marsh., var. KEWEENAWENSIS Farwell, Mich. Acad. Sci. Ann. Rep. vi. 206 (1904). Most if not all material from the Maritime Provinces and Newfoundland belongs to this northern variety, characterized by broadish often obovate leaves with a satiny or lustrous velvety pubescence. It is widely dispersed in Nova Scotia in both dry and wet habitats.

** *S. Smithiana* Willd. See Fernald & Wiegand, RHODORA, xii. 104, 137 (1910). Naturalized on clay bank by the sea, Baddeck.

* *S. purpurea* L. Very abundantly naturalized by wet roadsides about Yarmouth. See p. 95.

MYRICA CAROLINENSIS Mill. Abundant in the silicious regions, but rare or perhaps largely absent from Digby to Truro.

* BETULA LUTEA Michx. f., var. ALLEGHANIENSIS (Britton) Ashe, Bull. Charleston Mus. xiv. 11 (1918). Wooded lake-margins of Yarmouth and Digby Cos. apparently as common as typical *B. lutea*. Macoun's records of *B. lenta* may be based on var. *alleghaniensis*.

* B. PAPYRIFERA Marsh., var. CORDIFOLIA (Regel) Fernald. Occasional in Yarmouth Co.

OSTRYA VIRGINIANA (Mill.) K. Koch. Not seen west of Annapolis Co. See pp. 137, 170.

** ALNUS INCANA (L.) Moench, var. HYPOCHLORA Call. Jahresb. Schles. Ges. lxix. pt. 2: 79 (1891). Leaves green beneath, slightly pubescent or glabrate. YARMOUTH Co.: thicket bordering Sloane Lake, Pleasant Valley.

Urtica dioica L. Waste ground about towns; occasional in Yarmouth and Shelburne Cos.

LAPORTEA CANADENSIS L. HANTS Co.: alluvial woods along Five-Mile River. See pp. 137, 170.

ARCEUTHOBIUM PUSILLUM Peck. Apparently common throughout the province. See p. 97.

** *Rumex alpinus* L. YARMOUTH Co.: abundantly naturalized in a springy field, Rockville. See p. 107.

R. PALLIDUS Bigel. Gravelly sea-beaches, Yarmouth and Shelburne Cos. See p. 155.

** *R. obtusifolius* L., var. *sylvestris* (Lam.) Koch. Lower leaves oblong-lanceolate, acute. Digby Co.: roadside ditches, Sandy Cove. Naturalized also about Charlottetown, Prince Edward Island, and Bay of Islands, Newfoundland.

R. maritimus L., var. fueginus (Phil.) Dusén. See St. John, Rhodora, xvii. 81 (1915). Queens Co.: brackish sands, scarce, Central Port Mouton and at mouth of Broad River. See p. 158.

R. Acetosa L. Thoroughly naturalized in damp fields and swales, Yarmouth and Digby Cos. and occasional elsewhere. See pp. 95, 107.

Polygonum lapathifolium L. Sp. Pl. i. 360 (1753) as to name-bringing synonym. *P. pennsylvanicum*, var. Curt. Fl. Lond. i. t. 25 (1777). *P. lapathifolium*, var. *petiolare* Stokes in With., Bot. Arr. ed. 2, i. 412 (1787). *P. lapath.*, var. *maculatum* Sibth. Fl. Oxon. 129 (1794). *P. nodosum* Pers. Syn. i. 440 (1805). *Persicaria maculata* (Sibth.) S. F. Gray, Nat. Arr. Brit. Pl. ii. 270 (1821). *Peutalis nodosa* (Pers.) Raf. Fl. Tell. iii. 14 (1836). *Pol. lapath.*, var. *nodosum* (Pers.) Wein. Enum. Petrop. 42 (1837). *Persicaria nodosa* (Pers.) Opiz, Sezn. 72 (1852). *Pol. lapath.*, subsp. *maculatum* (Sibth.) Dyer & Trimen, Journ. Bot. ix. 36 (1871). *Pol. maculatum* (Sibth.) Babington, Man. ed. 7, 301 (1874).—Local weed in cultivated land, Yarmouth.

I see no reason to restrict the name *P. lapathifolium* L. to *P. scabrum* Moench, as is done by some European authors. Admitting that the Linnean species was a mixture of that and the purplish-flowered plant separated as *P. nodosum* Pers., we have two essential facts which lead to the retention of *P. lapathifolium* for *P. nodosum*. Linnaeus's account was as follows:

"*Lapathifolium* 6. POLYGONUM floribus pentandris semidigynis, staminibus corollae regulari aequalibus.
Persicaria floribus pentandris digynis, corolla regulari staminibus aequali. *Wach. ultr.* 257.
Persicaria florum staminibus quinis semidygnis, stylo bifido corollae regulari aequantibus. *Hort. cliff.* 42.
Persicaria major, lapathi foliis, calyce floris purpureo. *Tournef. inst.* 510. *Raj. suppl.* 119.
Persicaria Hydropiper. *Lob. ic.* 315.
Habitat in Gallia."

From this it should be quite clear that Linnaeus derived his specific name from *Persicaria major, lapathi foliis, calyce floris purpureo* of Tournefort and of Ray. On reference to Tournefort we find nothing but the brief description above quoted, but Ray in his full account says "*Calix* purpurascens lineam unam longus est," which better describes the shorter perianth of *P. nodosum* than the longer, usually

greenish perianth of *P. scabrum;* for in *P. nodosum*, the achene of which about equals the perianth, the achene is correctly described by Rouy as "petits (2 mm. sur 1½)" while the green-flowered *P. scabrum* has "achaînes très grands (3 mill. de long sur 2½)". In other words, *Persicaria major, lapathi foliis, calyce floris purpureo* of Tournefort and of Ray, the plant from which Linnaeus directly took the specific name, has not only the purple flowers but the small calyx of *P. nodosum* Pers.

Again in the splitting up of the complex *P. lapathifolium* of Linnaeus the first element described under a new name was *P. Persicaria* * *tomentosum* Schrank (1789) or *P. scabrum* Moench (1794) or *P. pallidum* With. (1796). These all antedated by many years *P. nodosum* Pers. (1805) and by the very sound "doctrine of residues" the removal from the complex first of *P. scabrum* left as *P. lapathifolium* the plant with small purplish flowers, the *Persicaria major, lapathi foliis* of Tournefort and of Ray. Thus by both these principles we arrive at the same conclusion, that the name *P. lapathifolium* belongs to *P. nodosum* Pers. not to *P. scabrum* Moench.

P. LAPATHIFOLIUM, var. SALICIFOLIUM Sibth. Fl. Oxon. 129 (1794). *P. incanum* Willd. Enum. Pl. Berol. 429 (1809), not F. W. Schmidt, Fl. Boem. iv. 90 (1794). *Persicaria salicifolia* (Sibth.) S. F. Gray, Nat. Arr. Brit. Pl. ii. 270 (1821). *Pol. lapathifolium*, var. *incanum* (Willd.) Koch, Syn. 617 (1837). *Pol. nodosum*, β. *incanum* (Willd.) Ledeb. Fl. Ross. iii. 521 (1849–51). *Pol. tomentosum*, var. *incanum* Robinson & Fernald in Gray, Man. ed. 7, 360 (1908), mostly, not *P. tomentosum*, var. *incanum* (Schmidt) Gurke, Pl. Eur. ii. 121 (1897) which is apparently only a minor form of *P. scabrum* Moench = *P. tomentosum* (Schrank) Gurke. *Pol. nodosum*, forma *salicifolium* (Sibth.) Moss, Cambr. Brit. Fl. ii. 117 (1914).—Damp sands and pond-margins, frequent in Yarmouth and Shelburne Cos.

P. SCABRUM Moench, Meth. 629 (1794). *P. lapathifolium* L. Sp. Pl. i. 360 (1753), in part. *P. pennsylvanicum* Huds. Fl. Angl. 148 (1762); Curtis Fl. Lond. i. t. 24 (1777); not L. *P. Persicaria* **tomentosum* Schrank, Baier. Fl. i. 669 (1789). *P. incanum* F. W. Schmidt, Fl. Boem. iv. 90 (1794). *P. pallidum* With. Bot. Arr. ed. 3, ii. 381 (1796). *P. tomentosum* (Schrank) Gurke, Pl. Eur. ii. 121 (1897); Robinson & Fernald in Gray, Man. ed. 7, 360 (1908); not Willd. *P. tomentosum*, var. *incanum* (Schmidt) Gurke, Pl. Eur. ii. 121 (1897). *Persicaria tomentosa* (Schrank) Bicknell, Bull. Torr. Bot. Cl. xxxvi. 453 (1909).—Damp sandy and gravelly shores where seemingly indigenous, and cultivated land as a weed.

* P. MUHLENBERGII (Meisn.) Watson. YARMOUTH Co.: dominant on a wet savannah bordering Butler's (Gavelton) Lake, Gavelton. See p. 166.

* P. ACRE HBK. Including var. *leptostachyum* Meisn. Common, apparently throughout the province.

** P. ROBUSTIUS (Small) Fernald, p. 147. YARMOUTH Co.: cold brook in sphagnous swale by Salmon (Greenville) Lake; boggy swale by Tusket (Vaughan) Lake, Gavelton; peaty and muddy dried-out pond-hole near head of St. John Lake, Springhaven; in running water, thicket at margin of Randel Lake, Argyle. See pp. 146, 147, 149, 155, 166, 168.

* P. HYDROPIPEROIDES Michx. Swales, savannahs and peaty shores, valleys of the Salmon and Tusket Rivers, Yarmouth Co.

** P. HYDROPIPEROIDES Michx., var. **digitatum**, n. var., planta 1–1.5 m. alta; foliis lineari-lanceolatis attenuatis plerumque 1.3–2 dm. longis; spicis densis 0.5–1 cm. crassis ad apices ramulorum plerumque aggregatis.

Plant 1–1.5 m. high; leaves linear-lanceolate, attenuate, mostly 1.3–2 dm. long: spikes densely flowered, 0.5–1 cm. thick, mostly crowded at the tips of the branches.—NOVA SCOTIA: boggy savannah bordering St. John Lake, Springhaven, Yarmouth Co., October 8, 1920, *Fernald* & *Linder*, no. 21,093 (TYPE in Gray Herb.).

Differing from typical *P. hydropiperoides* in its great height, very elongate leaves, thick crowded spikes and very late flowering. For further notes see p. 168.

P. RAII Babington. See Fernald, RHODORA, xv. 72 (1913). Damp sands and gravels of the coast from Shelburne Co. to Cape Breton. See pp. 150, 158, 165.

P. ACADIENSE Fernald, RHODORA, xvi. 188 (1914). To the original station at Grand Narrows should be added: gravelly beach of Great Bras d'Or, Kidstone Island, very scarce. See pp. 134, 165.

* P. FOWLERI Robinson, RHODORA, iv. 67 (1902). *P. buxifolium* Nutt. in Bong. Veg. Ins. Sitcha, 161 (1832), *nomen seminudum*, as to Sitka plant only, not as to synonymy nor apparently as to reference to Nuttall's specimen; not Bieb. *P. aviculare*, ε. *buxifolium* Ledeb. Fl. Ross. iii. 532 (1849–51) as to Sitka plant only. *P. littorale*, β. *buxifolium* Meisner in DC. Prodr. xiv. 98 (1856) as to description and plant. *P. maritimum* Fowler, Prelim. List Pl. N. B. 53 (1885), not L. (1753). *P. littorale sitchense* Small, Mem. Dept. Bot. Columbia Col. i. 102 (1895).—QUEENS Co.: with *P. allocarpum* on damp sand-flats, Central Port Mouton. VICTORIA Co.: gravelly beaches of Great Bras d'Or, Baddeck and Kidstone Island. Previously collected by J. R. Churchill on the beach at Aspy Bay.

The name *P. Fowleri* is here retained as the first adequately defined *specific* name, the name *P. buxifolium* Nutt. being open to very serious doubt. In the first place Nuttall did not publish his *P. buxifolium*, a species which Bongard ascribed to him as if it had been published. Bongard's publication was as follows:

"133. *Polygonum buxifolium Nutt.*! P. aviculare β latifolium Michx. Fl. Bor. am. I. p. 237.
Polygono aviculari simillimum; sed floribus semper *pentandris* distinctum. Specimina Nuttalliana exacte cum Sitchensibus conveniunt."

From this it is evident that Bongard had a plant from Sitka which he thought to be like Nuttall material which had been called *P. buxifolium* and which was identified with *P. aviculare* β. *latifolium* Michx., and it is noteworthy that Bongard's descriptive note was borrowed directly from Nuttall and the name *buxifolium* from Michaux's description of *P. aviculare β. latifolium.* Thus, in the original publication of β. *latifolium* from "Kentucky et regione Illinoensi," a plant which seems to have been *P. erectum* L., Michaux said "foliis lato-ovalibus, obtusis: quasi *buxifolium* [italicis mine]." —Michx. Fl. Bor.-Am. i. 237 (1803). Later, in 1818, in his *Genera*, i. 254, Nuttall described *P. aviculare* as having "flowers octandrous" and maintained β. *latifolium* [= ? *P. erectum*] with "leaves broad oval, obtuse, flowers pentandrous, stem adscendent." As a matter of fact, however, the stamens of *P. aviculare* vary from 5–8, so that Bongard's descriptive phrase, "Polygono aviculari simillimum; sed floribus semper *pentandris* distinctum," borrowed directly from Nuttall's description of a plant of Kentucky and Illinois and applied to a maritime plant of Sitka, does not differentiate the Sitkan plant and the name *P. buxifolium* at best is a *nomen seminudum* based upon a complete misconception. The Sitka material, called by Bongard *P. buxifolium*, has little in common with *P. erectum* or any other species of "Kentucky et regione Illinoensi" but, as shown by a sheet preserved in the Prodromus herbarium at Geneva, is exactly *P. Fowleri*, a maritime plant of the Gulf of St. Lawrence, Nova Scotia and eastern Newfoundland and of the shores of the North Pacific from Siberia and Alaska to Washington. The first *real description* of this Sitka plant was that of Meisner in DeCandolle's Prodromus, where a definite characterization was given—a diagnosis which applies equally well to the eastern material of *P. Fowleri.* Meisner's description, published in 1856, was as follows:

P. LITTORALE, "β. *buxifolium* (Ledeb.! fl. ross. 3, p. 532, sub *P. aviculari*), caulibus abbreviatis, foliis lineari-oblongis obtusis attenuato-subpetiolatis subeveniis, axillis 1–2-floris, achaenio calycem paulo superante subnitido minute punctato obsolete striato. In ins. Sitka (Eschscholtz!)."

This diagnosis of Meisner's, as stated, was based upon the Sitka material and accurately describes it, the earlier published phrases under the names *P. buxifolium* and *P. aviculare*, var. *buxifolium* having been borrowed without change from Michaux's and Nuttall's descriptions of *P. aviculare*, β. *latifolium* from Kentucky and Illinois, a plant which is certainly not conspecific with Eschscholtz's Sitkan plant. It is, therefore, quite clear that the latter plant was not truly characterized until Meisner's publication of it as a variety and that the first specific name clearly belonging to the plant is *P. Fowleri*.

* P. ALLOCARPUM Blake, RHODORA, xix. 234 (1917). Characteristic of sea-beaches and tidal sand-flats from Digby Co. to Queens Co. See pp. 151, 163.

* *P. cuspidatum* Sieb. & Zucc. Roadsides and waste ground, Yarmouth and Halifax.

** *P. polystachyum* Wall. A tall perennial of the gardens, with very long caudate-tipped and truncate-based leaves. Beginning to spread to waste lands about Yarmouth.

** ATRIPLEX GLABRIUSCULA Edmonston, Fl. Shetl. 39 (1845). *A. Babingtonii* Woods, Tourist's Fl. 316 (1850). For detailed synonymy see Moss, Camb. Brit. Fl. ii. 177 (1914).

A. glabriuscula, a species of northwestern Europe—Scandinavia, Denmark, north Germany and France to the Faeröes and Iceland—recognized (usually as *A. Babingtonii*) by such conservative European systematists as Britten & Rendle, Druce, Moss, Hartman, Rouy and Ascherson & Graebner, is abundant on the sandy and gravelly sea-shores from Newfoundland to Maine and very locally to Rhode Island, and casual on ballast southward. It is one of the maze of plants passing as *A. patula* and *A. hastata*. The latter, probably best considered as variations of one species, have the spiciform branches of the inflorescence naked except at base, the freely tuberculate bracteoles 1–5 mm. long (except in the rare *A. patula*, var. *bracteata* with bracteoles 1–1.5 cm. long), and the seeds 1–2 mm. in diameter. *A. glabriuscula*, on the other hand, has leafy-bracted inflorescences, large and less tuberculate fruiting bracteoles (0.5–1.2 cm. long) and seeds 2–4 mm. in diameter. In America *A. glabriuscula* is so clearly restricted to the region from Newfoundland to New England, where so many identities with the flora of north-western Europe are known, while the semi-cosmopolitan *A. patula* crosses the continent, that there is little question that we should recognize it as a distinct species. A few immature herbarium-specimens can-

not be satisfactorily placed but all fully mature specimens seem to be clearly either *A. patula* (including *A. hastata*) or *A. glabriuscula*. *A. glabriuscula*, at least in Nova Scotia, matures much earlier than *A. patula* and its var. *hastata*. The following American specimens are referred to

A. GLABRIUSCULA Edmonston. NEWFOUNDLAND: sea-beach, Middle Arm, Bay of Islands, August 22, 1896, *Waghorne*, no. 49; damp sandy shores, St. George's, August 13, 1910, *Fernald* & *Wiegand*, no. 3318. QUEBEC: marshy shore, Pointe au Maurier, Charnay, Saguenay Co., August 27, 1915, *St. John*, no. 90,408; sea-strand, Ile Herbée, Archipel du Vieux-Fort, July 24, 1915, *St. John*, no. 90,409; Anticosti, August 1, 1861, *Hyatt, Shaler* & *Verrill;* Anse au Sanatorium, Anticosti, August 20, 1917, *Fr. Marie-Victorin*. MAGDALEN ISLANDS: Brion Island, August 13, 1914, *St. John*, no. 1863; rivages, Ile du Hâvre-aux-Maisons, August 15, 1919, *FF. Marie-Victorin* & *Rolland-Germain*. NOVA SCOTIA: gravelly beach of Great Bras d'Or, Kidstone Island, August 28, 1920, *Fernald* & *Long*, nos. 21,149, 21,151; pebbly shore, Purcell's Cove, Halifax, September 2–6, 1901, *Howe* & *Lang*, no. 1503; damp sand-flats, Central Port Mouton, *Fernald, Bissell, Graves, Long* & *Linder*, no. 21,444; upper border of gravelly strand, Villagedale, August 7, 1920, *Fernald, Long* & *Linder*, no. 21,141; damp sand-flat back of beach, Sand Beach, Yarmouth Co., August 10 and September 7, 1920, *Fernald, Long* & *Linder*, nos. 21,142, 21,152; cobbly barrier beach, Pembroke Shore, July 5, 1920, *Long* & *Linder*, no. 21,140, October 6, *Fernald* & *Linder*, nos. 21,155, 21,156, 21,157. MAINE: railroad yard (introduced), Fort Fairfield, September 19, 1900, *Fernald;* strand, Pleasant Point, Perry, August 16, 1909, *Fernald;* strand, Carlow Island, Passamaquoddy Bay, August 16, 1909, *Fernald;* Cutler, August 27, 1902, *Kate Furbish;* Cross Island, August, 1892, *F. L. Harvey;* sandy beach, Great Wass Island, Jonesport, August 5, 1907, *Cushman* & *Sanford*, no. 1471; beach, Great Cranberry Isle, September 5, 1891, *Rand;* east shore of Little Cranberry Isle, August 6, 1889, *Redfield;* Sorrento, 1891, *Kate Furbish;* Swan's Island, August, 1911, *Kate Furbish;* Matinicus, 1918, *C. A. E. Long*, no. 64; open sand, sea-shore, Pemaquid Beach, Bristol, September 9, 1898, *Chamberlain;* gravelly shore, Southport, August 3, 1894, *Fernald;* Fort Popham, Phippsburg, September 7, 1907, *Kate Furbish;* Wells, 1898, *Kate Furbish*. MASSACHUSETTS: beach, Nahant, September 16, 1894, *Williams;* salt marsh, Seaview, October 4, 1896, *Williams;* beach near Eel River, Plymouth, September 23, 1853, *Wm. Boott;* southwestern section of Barnstable, September 16–17, 1918, *Bean, Bird* & *Knowlton*. RHODE ISLAND: Tiverton, September 27, 1903, *Williams;* seashore, Middletown, August 24, *M. B. Simmons*. PENNSYLVANIA: ballast, Greenwich Point, Philadelphia, August 25–October 1, 1874, *C. F. Parker*.

** A. PATULA L., var. BRACTEATA Westlund, Sveriges Atripl. 57 (1861); Moss, Cambr. Brit. Fl. ii. 174, t. 176 (1914). An extreme variation of northern Europe, with elongate bracteoles up to 1–1.5 cm. long, even longer than in *A. glabriuscula*, but with nearly naked inflorescence and small seed. Known in North America only from a single specimen collected in brackish or saline marsh near mouth of George River, Cape Breton.

SPERGULARIA SALINA J. & C. Presl.; Fernald & Wiegand, RHODORA, xii. 162 (1910). Occasional on saline shores.

S. LEIOSPERMA (Kindb.) F. Schmidt; Fernald & Wiegand, l. c. Occasional on saline shores.

SAGINA NODOSA (L.) Fenzl, var. PUBESCENS Mert. & Koch. Sand-flats, Queens and Shelburne Cos. See pp. 150, 158.

ARENARIA PEPLOIDES L., var. ROBUSTA Fernald, RHODORA, xi. 114 (1909). So far as we observed, on many beaches from Yarmouth to Cape Breton, this is the only variety of the species in the province.

STELLARIA ULIGINOSA Murr. Wet sand and springy spots at various stations in Digby and Victoria Cos.

S. LONGIFOLIA Muhl. COLCHESTER CO.: wet sandy margin of pool in flood-plain of Salmon River, Truro. Macoun reports the species as common but his records were based largely on the introduced weed, *S. graminea*.

* *Lychnis Flos-cuculi* L. Swale, Yarmouth.

** *Silene gallica* L. Railroad yard, Digby. Collected in the same locality in August, 1902, by the late Geo. E. Morris. See p. 94.

* *Dianthus Armeria* L. DIGBY CO.: rather scarce, on a clayey roadside bank, Sandy Cove.

* NYMPHOZANTHUS RUBRODISCUS (Morong) Fernald, RHODORA, xxi. 187 (1919). Lakes and quiet streams, Yarmouth Co. to Hants Co. Collected by Howe & Lang in Pictou Co. See p. 137.

* NYMPHAEA ODORATA Ait., var. ROSEA Pursh. See p. 161. Bog-pools and lake-margins, Digby and Yarmouth Cos.

BRASENIA SHREBERI Gmel. In various lakes of Yarmouth Co.

RANUNCULUS PURSHII Richardson. Shallow water and open swamps, Cumberland Co. to Cape Breton and Hants Co. See pp. 131, 133, 164, 170.

* R. FLAMMULA L.; Fernald, RHODORA, xix. 135 (1917). YARMOUTH CO.: in a cold spring-brook, Tusket. See p. 157.

R. ABORTIVUS L. Not seen west of Hants Co. See p. 133.

R. RECURVATUS Poir. Rich woods, Cumberland Co. to Cape Breton and Annapolis Co. See pp. 136, 164, 170.

Chelidonium majus L. About an old cellar-hole, Arcadia, Yarmouth Co.

Lepidium campestre (L.) R. Br. Waste land, Yarmouth.

* *L. Draba* L. Roadsides, waste places and ballast lands, Yarmouth, scarce. See p. 140.

Coronopus didymus (L.) Sm. Waste ground, railroad yards, etc., Digby, Yarmouth and Sand Beach (Yarmouth Co.). See p. 140.

* SUBULARIA AQUATICA L. Sandy and gravelly bottoms of lakes. YARMOUTH CO.: Jassy Lake, Lake Annis; Salmon (Greenville) L.; Clearwater L., Belleville; Frost L., Argyle; Great Pubnico L. SHELBURNE CO.: Clement Pond, Barrington. VICTORIA CO.: Warren L., Ingonish, *J. R. Churchill.* See pp. 142, 143, 151, 156.

* *Camelina microcarpa* Andrz. Casual weed of railroad yards.

* *Neslia paniculata* (L.) Desv. Casual weed of railroad yards and waste places, nowhere abundant but often seen in small quantity.

* *Conringia orientalis* (L.) Dumort. Casual in railroad yards.

* *Sisymbrium officinale* (L.) Scop. Occasional weed in Digby, Yarmouth and Queens Cos. Var. *leiocarpum* DC. was not seen. See p. 140.

* *Erisymum parviflorum* Nutt. CUMBERLAND CO.: gravelly railroad yard, Springhill Junction. See p. 132.

DENTARIA DIPHYLLA Michx. ANNAPOLIS CO.: brookside in mixed woods, southern slope of North Mt., near Middleton. HANTS CO.: rich woods near gypsum cliffs along Five-Mile River. See pp. 137, 140, 170.

DROSERA LONGIFOLIA L. *D. intermedia* Hayne. The great abundance of this species in wet peaty and sandy soils from Yarmouth to Annapolis Co. makes it difficult to understand Dr. C. B. Robinson's belief that in Nova Scotia this species is restricted to Cape Breton (see p. 90).

** DROSERA **longifolia** × **rotundifolia,** n. hybr., petiolis sparse pilosis, laminis late obovatis.

Petioles sparingly pilose; blades broadly obovate.—NOVA SCOTIA: with the two parents and exactly intermediate between them, on a knoll in wet peaty slough in barrens, Lower Argyle, August 11, 1920, *Fernald, Bissell, Graves, Long* & *Linder*, no. 21,349 (TYPE in Gray Herb.). See p. 155.

TILLAEA AQUATICA L. SHELBURNE CO.: damp sand-flats back of beach, Villagedale. See p. 150.

Sedum acre L. SHELBURNE CO.: ledgy roadside, Barrington.

S. stoloniferum Gmel. Spreading to rocky or gravelly roadsides at many points in Digby, Yarmouth and Shelburne Cos. See p. 94.

S. ROSEUM (L.) Scop. DIGBY CO.: basaltic cliffs by Bay of Fundy, Sandy Cove. See p. 163.

** HAMAMELIS VIRGINIANA L., var. PARVIFOLIA (Nutt.) T. & G. Fl. i. 597 (1840). A very striking extreme of the species with the comparatively small and thick leaves densely stellate-hirsute and usually rufescent beneath. Described by Nuttall from Pennsylvania, and cited by Torrey & Gray from Louisiana, but the shrub occurs northward into New England and Nova Scotia. The following are characteristic specimens. NOVA SCOTIA: thickets bordering

Great Pubnico Lake, September 6, 1920, *Fernald, Long* & *Linder*, no. 21,395; bank of East Branch of Tusket River, Quinan, October 8, 1920, *Fernald* & *Linder*, no. 21,396. Maine: damp woods, Orono, September, 1887, *Fernald;* South Poland, October, 1893, *Furbish;* Brunswick, August 26, 1913, *Furbish*. Vermont: Rutland, October 3, 1898, *Eggleston*. Massachusetts: Georgetown, *C. N. S. Horner;* damp rocky woods, West Roxbury, October 10, 1896, *W. P. Rich;* low woods, Montague, May 11, 1912, *Wheeler* & *Wiegand*.

* Ribes hirtellum Michx., var. calcicola Fernald, Rhodora, xiii. 76 (1911). Commoner in Nova Scotia than the typical form of the species. The varietal designation a misnomer.

R. lacustre (Pers.) Poir. Swampy woods, Cumberland Co. to Hants Co. and Cape Breton.

R. triste Pallas, var. albinervium (Michx.) Fernald. Rich low woods, Cumberland Co. to Hants Co. and Cape Breton.

** Pyrus arbutifolia (L.) L. f. Frequent in Yarmouth Co.: sterile meadows, Arcadia; gravelly thicket by Salmon (Greenville) Lake; thicket by Butler's (Gavelton) L.; thicket by Great Pubnico L. Fruit cherry-red, maturing later than that of the commoner P. arbutifolia, var. atropurpurea (Britton) Robinson. See p. 156.

P. **dumosa** (Greene) n. comb. *Sorbus Aucuparia, β.* Michx. Fl. Bor.-Am. i. 290 (1803). *P. sambucifolia* of Eastern American records, not C. & S. *P. americana*, var. *decora* Sarg. Silva, xiv. 101 (1892). *S. dumosa* Greene, Pittonia, iv. 129 (1900). *S. scopulina* Greene, l. c. 130 (1900). *S. subvestita* Greene, l. c. (1900). *Pyrus sitchensis* Piper, Mazama, ii. 107 (1901) in part, not *Sorbus sitchensis* Roem. *S. decora* (Sarg.) Schneider, Bull. Herb. Boiss. sér. 2, vi. 313 (1906). —Apparently throughout, but less common than *P. americana*.

Sorbus sitchensis Roem. Syn. Mon. iii. 139 (1847), the nomenclatorial basis of *Pyrus sitchensis* (Roem.) Piper, with which our shrub and small tree has been recently identified, proves, according to Rehder, to be the *S. pumila* Raf. which was later described as *P. occidentalis* Watson. This species certainly has little to do with our large-fruited tree and shrub; but there seems to be no specific distinction between the common Rocky Mountain species and ours.

Frère Arsène has collected on Miquelon a hybrid of *P. americana* with *P. arbutifolia*, var. *atropurpurea*. Similar hybrids of *P. americana* or the introduced *P. Aucuparia* with *P. arbutifolia* and *P. melanocarpa* are occasionally found in New England. Such frequent occurrences of natural hybrids between these species, which are considered by many authors as distinct genera (*Sorbus* and *Aronia*) would seem to weaken the line of separation between these "genera."

** Amelanchier stolonifera Wiegand, Rhodora, xiv. 144 (1912). Apparently not common in the province. Annapolis Co.: boggy depressions and moist thickets on sandy plains, Middleton.

** A. STOLONIFERA Wiegand, var. **lucida,** n. var., foliis crassis supra atroviridibus lucidis; ovario ad apicem glabro vel sparse pubescente.

Leaves thick, dark green and lustrous above: ovary glabrous at apex or only sparsely pubescent.—NOVA SCOTIA: dry rocky and gravelly railroad right-of-way, west of Bridgewater, July 17, 1920, *Fernald, Bissell, Pease, Long* & *Linder*, no. 21,432; slaty ledges and cobbly upper beach of Shubenacadie Grand Lake, July 19, *Fernald* & *Bissell,* no. 21,433; dry open barrens, Springhill Junction, July 18, *Pease* & *Long,* no. 21,434; dryish open sandy plain, Middleton, July 20, *Fernald, Pease* & *Long*, no. 21,435, *Bean* & *White*, no. 21,436; moist woods and thickets, Middleton, July 21, *Fernald* & *Pease,* no. 21,437 (TYPE in Gray Herb.); boggy barrens west of Goose Lake, Argyle, August 4, *Fernald* & *White,* no. 21,438; boggy barrens near Clement Pond, Barrington, August 9, *Fernald, Long* & *Linder,* no. 21,439. For further discussion see pp. 130, 135, 138.

** A. CANADENSIS (L.) Medic.; Wiegand, RHODORA, xiv. 150 (1912). HANTS CO.: talus of gypsum cliffs, Five-Mile River. See pp. 136, 170.

** A. LAEVIS Wiegand, var. **nitida** (Wiegand), n. comb. *A. laevis,* forma *nitida* Wiegand, RHODORA, xiv. 155 (1912).

This green- and lustrous-leaved extreme is so characteristic and uniform on the wooded terraces of Sissiboo River, Weymouth (nos. 21,441, 21,442) that it seemed to all members of the party who saw it a very distinct shrub. Also collected in mixed woods on the southern slope of North Mountain, Middleton, *Long*, no. 21,447.

** A. INTERMEDIA Spach; Wiegand, RHODORA, xxii. 147 (1920). Wet or dry open soil, thickets, borders of woods, etc. Common, at least from Yarmouth to Hants and Queens Cos. See p. 103.

** CRATAEGUS JONESAE Sargent. QUEENS CO.: hillside pasture, Bell Point, Port Mouton. See p. 159.

FRAGARIA VESCA L., var. AMERICANA Porter. HANTS CO.: talus of gypsum cliffs near Five-Mile River. VICTORIA CO.: rock faces and crevices of gypsum cliffs, Port Bevis. See pp. 136, 170.

* *Potentilla recta* L. DIGBY CO.: dry open fields, Digby.

P. FRUTICOSA L. YARMOUTH CO.: open spruce bog near Cedar Lake. DIGBY CO.: wet savannah along Little River east of Tiddville; dry clayey roadside, Sandy Cove. HANTS CO.: talus of gypsum cliffs near Five-Mile River. See p. 101.

* *P. Anserina* L., var. *sericea* Hayne. See Fernald, RHODORA, xi. 8 (1909). Naturalized in waste ground about wharves at Yarmouth.

P. procumbens Sibth. YARMOUTH CO.: along path in spruce and alder thicket, Lower Argyle. VICTORIA CO.: grassy road through spruce and fir woods, Baddeck. See p. 155.

** *Filipendula hexapetala* Gilib. Roadside thicket, Yarmouth.

* *F. Ulmaria* (L.) Maxim. Abundantly naturalized by roadsides about Yarmouth.

Geum canadense Jacq. Frequent in rich soil about towns, often appearing like an introduced weed. See p. 137.

G. virginianum L. Not seen west of Annapolis Co. See pp. 137, 170.

G. strictum Ait. Frequent from Annapolis Co. eastward. See p. 137.

Rubus idaeus L. See Fernald, Rhodora, xxi. 96 (1919). Well established as a garden escape about Yarmouth.

R. idaeus, var. strigosus (Michx.) Maxim.; Fernald, l. c. Frequent but apparently less common than the next.

R. idaeus, var canadensis Richardson; Fernald, l. c. 97. Frequent.

R. Chamaemorus L. Common on boggy barrens of the Atlantic slope, rare elsewhere. Digby Co.: Tiddville.

R. alleghaniensis Porter. Common in dry thickets and clearings eastward at least to Halifax and Pictou Cos.

** R. glandicaulis Blanchard, var. **neoscoticus**, n. var., a forma typica recedit caulibus crassioribus; foliis supra breviter villosis, subtus densissime subvelutinis; pedicellis crassioribus rectis.

Differing from the typical form of the species in its stouter canes: leaves short-villous above, very densely almost velvety beneath: pedicels stouter, straight.—Yarmouth County, Nova Scotia: recently burned clearing near Beaver Lake, July 11, 1920, *Fernald, Bissell, Pease, Long* & *Linder*, no. 21,600; roadside thicket, Wellington, July 11, 1920, *Fernald, Bissell, Pease, Long* & *Linder*, no. 21,569 (type in Gray Herb.); rocky roadside thicket, Yarmouth, September 7, 1920, *Fernald, Long* & *Linder*, no. 21,603; abundant in and around Yarmouth, July 25, 1909, *W. H. Blanchard*, nos. 718, 719; dryish thickets, Sand Beach, July 12, 1920, *Fernald* & *Linder*, no. 21,543; dry thickets and borders of woods, Belleville, July 27, 1920, *Long* & *Linder*, no. 21,549; rocky clearing west of Eel Lake, July 27, 1920, *Fernald, Bean* & *White*, no. 21,579.

In its best development var. *neoscotica* has grayish foliage dull above, lustrous beneath, and the leaflets, especially of the new canes so full as to appear puckered or strongly rugose. Typical R. glandicaulis, which was collected by Blanchard at Granville, Annapolis Co. (no. 717), and which is frequent in southern New Brunswick and on Prince Edward Island, is a more slender plant, with the leaves glabrous and shining above, pubescent but hardly lustrous beneath, and its pedicels almost capillary and usually upwardly arching. Material from Canso (*Fowler*) is somewhat transitional.

** R. orarius Blanchard, Rhodora, viii. 169 (1906). Frequent in damp thickets of Digby, Yarmouth and Shelburne Cos. Markedly

less pubescent than *R. alleghenicnsis*, though with the lower leaf-surfaces thinly velvety; the racemes (except at tip of cane) copiously leafy-bracted, and the sparingly glandular pedicels more often with scattered bristles; in these characters closely matching the series of Blanchard's Cape Porpoise specimens designated by him as the type. Heretofore known from York Co., Maine and from Cape Cod, Massachusetts. DIGBY CO.: rich moist open thicket by brook, Sandy Cove, *Fernald* & *Long*, nos. 21,589, 21,592, 21,602. YARMOUTH CO.: gravelly shore of Lake Annis, *Bissell, Pease* & *Linder*, no. 21,568; open woods and thickets near Butler's (Gavelton) Lake, Gavelton, *Fernald, Long* & *Linder*, no. 21,609; damp rocky thicket, Pubnico, *Fernald, Long* & *Linder*, no. 21,613. SHELBURNE CO.: rocky spruce and alder thickets, and dry gravelly slopes, Shag Harbor, *Fernald, Bissell* & *Linder*, nos. 21,581, 21,617 and 21,628.

R. ANDREWSIANUS Blanchard. YARMOUTH CO.: open rocky woods and thickets near Butler's (Gavelton) Lake, Gavelton, *Fernald, Long* & *Linder*, no. 21,540; moist clearing in spruce woods near Randel Lake, Argyle, *Long* & *Linder*, no. 21,624.

** R. AMNICOLA Blanchard, RHODORA, viii. 170 (1906) as *R. amnicolus*. The type collection is well matched by our material from DIGBY CO.: gravelly railroad bank, Digby, *Bissell, Pease, Long* & *Linder*, no. 21,625.

Brainerd & Peitersen treat *R. amnicola* as a hybrid of *R. argutus* and *R. canadensis*. As yet no typical *R. argutus* has been found in Nova Scotia, the nearest approach to it being *R. Andrewsianus* which they consider a hybrid of *R. alleghenicnsis* and *R. argutus*.

R. CANADENSIS L. Common throughout the province.

R. MULTIFORMIS Blanchard. Blanchard included different plants under this name. The typical species is a very distinct low-arching or trailing, freely branching and "tipping" shrub, with remotely prickly coarse canes, glabrous leaves with caudate-tipped leaflets and very lax and elongate racemes (suggesting those of *R. elegantulus*), the filiform pedicels not bristly. The following Nova Scotia material closely matches Blanchard's type series. KINGS CO.: Kentville, *Blanchard*, no. 726. ANNAPOLIS CO.: Annapolis, *Blanchard*, no. 727. DIGBY CO.: thickets bordering savannahs by Little River, Tiddville, *Fernald* & *Long*, no. 21,576; thickets and steep wooded banks along Sissiboo River, Weymouth, *Fernald, Bissell, Graves, Long* & *Linder*, no. 21,537; moist mixed woods and thickets, Meteghan, *Fernald* & *Long*, no. 21,560; clearings in wet spruce woods, Meteghan, *Fernald* & *Long*, no. 21,562. YARMOUTH CO.: low woods and thickets by Butler's (Gavelton) Lake, Gavelton, *Fernald, Long* & *Linder*, no. 21,590; boggy clearings and borders of spruce woods, Pubnico, *Fernald, Long* & *Linder*, no. 21,611; thicket bordering Great Pubnico Lake, *Fernald, Long* & *Linder*, no. 21,539. QUEENS CO.: gravelly thicket near mouth of Broad River, *Fernald* & *Bissell*, no. 21,621.

This species may prove to be an extreme of *R. elegantulus*.

** R. BIFORMISPINUS Blanchard. SHELBURNE Co.: rocky spruce and alder thickets, Shag Harbor, *Fernald, Bissell* & *Linder*, no. 21,618.

** R. RECURVANS Blanchard. YARMOUTH Co.: upper border of cobbly beach of Tusket (Vaughan) Lake, Gavelton, *Fernald, Long* & *Linder*, no. 21,618; rocky clearing west of Eel Lake, *Fernald, Bean* & *White*, no. 21,578.

R. RECURVICAULIS Blanchard, RHODORA, viii. 153 (1906). Apparently throughout the province. The following are referred here. VICTORIA Co.: fencerows, thickets and borders of woods, Baddeck, *Fernald* & *Long*, no. 21,573. GUYSBOROUGH Co.: Boylston, *Hamilton*, no. 19,985 (Geol. Surv. Can. as *R. canadensis*). HALIFAX Co.: Purcell's Cove, Halifax Harbor, *Howe* & *Lang*, no. 1578 (as *R. Randii*); Dartmouth, *Blanchard*, nos. 735, 736. QUEENS Co.: dry border of woods, Port Mouton, *Fernald, Long* & *Linder*, no. 21,601. SHELBURNE Co.: spruce and maple swamp by Clement Pond, Barrington, *Fernald, Long* & *Linder*, no. 21,623. YARMOUTH Co.: gravelly thicket bordering Salmon (Greenville) Lake, *Fernald, Long* & *Linder*, no. 21,620; gravelly railroad embankment, Yarmouth, *Fernald, Long* & *Linder*, no. 21,605. DIGBY Co.: dry open field, Digby, *Bissell, Pease, Long* & *Linder*, no. 21,626. ANNAPOLIS Co.: dryish open sandy plains, Middleton, *Fernald, Pease* & *Long*, nos. 21,547, 21,597, 21,598.

Rydberg in the North American Flora (xxii. 474, 475) assigns *R. procumbens* Muhl. a range from "Maine to Virginia," etc., but treats *R. recurvicaulis*, which is common in Nova Scotia and Newfoundland, as *R. pergratus* × *procumbens*. In view of the fact that neither *R. pergratus* nor *R. procumbens* is known in either Nova Scotia or Newfoundland *R. recurvicaulis* would seem, by Rydberg's interpretation, to be one of the *absent treatment* hybrids so popular with many students of *Rubus*. Rydberg includes other such supposed hybrids on the same page (in view of the fact that *R. procumbens* is unknown from east of southern Maine): "*R. canadensis* × *procumbens* . . . Nova Scotia and Maine" and "*R. hispidus* × *procumbens* . . . . Nova Scotia to Vermont and Long Island, New York."

I have been unable to separate from *R. recurvicaulis*, Blanchard's *R. arenicola*, RHODORA, viii. 151 (1906) as *R. arenicolus*. See p. 138.

R. PLICATIFOLIUS Blanchard, RHODORA, viii. 149 (1906). YARMOUTH Co.: swampy woods and wet thickets by Eel Lake, *Fernald, Bean* & *White*, no 21,580.

* R. JUNCEUS Blanchard. YARMOUTH Co.: sphagnous swale bordering Beaver Lake, *Fernald, Bissell, Pease, Long* & *Linder*, no. 21,556.

R. VERMONTANUS Blanchard, Am. Bot. vii. 1 (1904). DIGBY Co.: moist thicket, Sandy Cove, *Fernald* & *Long*, no. 21,591; open sphagnous bog and moist thickets, Meteghan, *Fernald* & *Long*, nos. 21,550, 21,561; dry banks along railroad, Hectanooga, *Bissell, Pease* & *Linder*, no. 21,588. YARMOUTH Co.: peat bog, Pembroke Shore, *Long* & *Linder*, no. 21,627; dryish thickets, Sand Beach, *Fernald* & *Linder*, no. 21,544. SHELBURNE Co.: rocky spruce and alder thickets, Shag Harbor, and rocky railroad bank, Wood Harbor, *Fernald, Bissell* & *Linder*, nos. 21,582, 21,616½, and 21,639.

This material is a perfect match for Blanchard's original specimens from York County, Maine, of *R. peculiaris*, a plant which is rightly referred by Brainerd & Peitersen to *R. vermontanus*. Rydberg (No. Am. Fl. xxii. 477) treats *R. peculiaris* as a hybrid of *R. nigricans* (apparently *R. setosus* Bigel.) and *R. pergratus*, but until *R. pergratus* is found in western Nova Scotia, where *R. peculiaris* (or *R. vermontanus*) is frequent, such a disposition of it there would seem hardly satisfactory. Incidentally, *R. pergratus* has the leaves velvety beneath and coarse prickles, *R. peculiaris* glabrous leaves and fine almost bristle-like prickles.

R. TARDATUS Blanchard. One of the most characteristic "half-high" species of damp thickets. CUMBERLAND Co.: gravelly thickets south of Amherst, *Fernald*, no. 21,586. HALIFAX Co.: thicket bordering ledgy and cobbly beach of Shubenacadie Grand Lake, *Fernald* & *Bissell*, nos. 21,553, 21,556. ANNAPOLIS Co.: Middleton, *Blanchard*, no. 732. DIGBY Co.: clearings in wet spruce woods, Meteghan, *Fernald* & *Long*, no. 21,564. YARMOUTH Co.: sphagnous swale bordering Beaver Lake, *Fernald, Bissell, Pease, Long* & *Linder*, no. 21,571; thicket at border of sandy and peaty beach, Trefry's Lake, Arcadia, *Fernald* & *Long*, no. 21,606; low woods and thickets by Butler's (Gavelton) Lake, Gavelton, *Fernald, Long* & *Linder*, no. 21,608; thicket bordering Great Pubnico Lake, *Fernald, Long* & *Linder*, no. 21,612. See p. 156.

Since *R. tardatus* is a dominant and very constant species of boggy thickets and lake-margins of Nova Scotia and of Prince Edward Island, Brainerd & Peitersen's treatment of it as "*R. flagellaris* × *setosus*" seems hardly satisfactory. *R. flagellaris* is unknown from east of southern Maine and *R. setosus* is not known from Prince Edward Island (the material so referred in the 7th edition of Gray's Manual being wrongly determined) and the only plant we have from Nova Scotia which is possibly referable to it is wholly uncharacteristic and may belong to another species.

** R. ABBREVIANS Blanchard. YARMOUTH Co.: rocky roadsides and borders of woods, Yarmouth, *Pease* & *Long*, no. 21,585, *Fernald, Bean* & *White*, no. 21,545, *Fernald, Long* & *Linder*, no. 21,557.

More glandular and less bristly than the characteristic shrub of the upland region of New Hampshire and Vermont but seemingly referable to it. A plant of Annapolis Co.: moist woods and thickets, Middleton, *Fernald* & *Pease*, no. 21,541, is less characteristic but is temporarily referred here.

* Rubus setosus Bigel. Our only Nova Scotian material which is possibly referable to *R. setosus* is from Digby Co.: border of clearing in wet mixed woods, Hectanooga, *Long* & *Linder*, no. 21,577, a remarkably stout development, with long canes 7 mm. in diameter and with unusually firm and thickened bristles, perhaps not correctly referred to *R. setosus*.

R. arcuans Fernald & St. John, Proc. Bost. Soc. Nat. Hist. xxxvi. 78, t. 2, fig. 7 (1921). To the Nova Scotia stations originally published should be added the following. Annapolis Co.: Granville, *Blanchard*, no. 728 (as *R. biformispinus*). Yarmouth Co.: gravelly bank, Yarmouth, *Pease* & *Linder*, no. 21,584; gravelly roadside near Saller Lake, Kemptville, *Fernald* & *Linder*, no. 21,538.

** R. jacens Blanchard. Common in southern Digby and Yarmouth Cos. Digby Co.: moist thicket, Meteghan, *Fernald* & *Long*, no. 21,551. Yarmouth Co.: rocky and gravelly woods and thickets bordering Cedar Lake, *Fernald, Bissell, Pease, Long* & *Linder*, no. 21,599; damp to dryish roadside thickets, Yarmouth, *Fernald, Bean* & *White*, no. 21,546; gravelly railroad embankment, Yarmouth, *Fernald, Long* & *Linder*, no. 21,558; dry gravelly railroad embankment, Arcadia, *Pease* & *Long*, no. 21,542; gravelly thicket, Lower Argyle, *Fernald, Bissell, Graves, Long* & *Linder*, no. 21,619.

Treated by Brainerd & Peitersen as "*R. hispidus* × *setosus*." The abundance of characteristic *R. jacens* in western Nova Scotia, where *R. setosus* is excessively rare if not quite unknown, suggests that the former is now, at least, a well established species.

R. hispidus L. Common throughout.

R. hispidus, var. major Blanchard, Rhodora, viii. 213 (1906). Yarmouth Co.: rocky roadside thicket, Yarmouth, *Fernald, Long* & *Linder*, no. 21,604.

Alchemilla vulgaris L.; Fernald & Wiegand, Rhodora, xiv. 232 (1912). A very abundant and rapidly spreading weed of fields and roadsides in Digby, Yarmouth and Shelburne Cos.; not eaten by browsing animals. See p. 94.

Agrimonia gryposepala Wallr. Less common than A. striata Michx., but found in rich thickets and woods from Digby Co. to Cape Breton. See p. 146.

** *Rosa rugosa* Thumb. This familiar hardy rose, now well naturalized on the coast of New England, is likewise becoming established at Yarmouth.

Prunus serotina Ehrh. Frequent from Halifax Co. westward.

* *Lupinus polyphyllus* Lindl. See Fernald, Rhodora, xvi. 94 (1914). Very abundantly naturalized on dry roadside banks, Chebogue Point, and less abundantly at other places in Yarmouth Co. Well naturalized along gravel of Salmon River, Truro. Beginning to spread from cultivation at Baddeck. See p. 105.

L. nootkatensis Donn. See Fernald, l. c. With the preceding in great abundance at Chebogue Point, Yarmouth Co. See p. 105.

** *Trifolium pratense* L., var. *frigidum* Gaudin. Yarmouth Co.: seepy open peaty slopes, Yarmouth. See p. 95.

** *T. dubium* Sibth. Yarmouth Co.: roadsides, Darling Lake, Arcadia and Belleville. See p. 101.

** *Vicia angustifolia* (L.) Reichard, var. *uncinata* (Desv.) Rouy & Foucaud; Fernald & Wiegand, Rhodora, xii. 140 (1910). Waste places about Yarmouth. Becoming well naturalized also in eastern Maine, New Brunswick, Prince Edward Island and Newfoundland. See p. 95.

Lathyrus palustris L. See Fernald, Rhodora, xiii. 50 (1911). Queens Co.: damp dune-thicket, Central Port Mouton. The plant generally passing as *L. palustris* is var. pilosus (Cham.) Ledeb.

L. palustris, var. macranthus (T. G. White) Fernald, Rhodora, l. c. Annapolis Co.: crests of basalt cliffs by Bay of Fundy, Margaretville.

* *L. pratensis* L. Cumberland Co.: border of boggy swale, Springhill Junction. See p. 132.

Apios tuberosa Moench. Yarmouth Co.: thickets bordering Salmon (Greenville) Lake; thicket bordering beach of Butler's (Gavelton) L., Gavelton. Queens Co.: damp thicket, Central Port Mouton. Halifax Co.: gravelly thicket bordering Shubenacadie Grand Lake. See p. 147.

Amphicarpa monoica (L.) Ell. Halifax Co.: thicket bordering beach of Shubenacadie Grand Lake.

* *Geranium pratense* L. Waste ground, Yarmouth. Collected in 1913 in dry fields, Springville, Pictou Co. (*St. John*, no. 1431).

* *Euphorbia hirsuta* (Torr.) Wiegand. Railroad gravel, Weymouth and North Sydney. Doubtless more general along the railroads.

Callitriche heterophylla Pursh. All our collections of *Callitriche* from Yarmouth Co. are of this species, no *C. palustris* being noted southwest of Annapolis Co. *C. heterophylla* was collected at various stations throughout the province.

Corema Conradii Torr. Already well known from dry plains and barrens of Halifax, Kings and Annapolis Cos. Frequent in appropriate habitats in Yarmouth, Shelburne and Queens Cos. See pp. 92, 137, 138, 142, 148, 150.

Ilex verticillata (L.) Gray. The Black Alder is so exceedingly variable that it often seems as if some definite specific lines should

be found in the group. I have spent much time in studying the seeds from all ripe fruit at hand in the hope that these would furnish sound characters, but, although the seeds show great diversity in size (2.8–4.5 mm. long) and outline, these variations seem to be in no way associable with other characters or with definite ranges. Besides the typical form of the species, which is common in Nova Scotia, the following recognizable varieties occur.

** I. VERTICILLATA, var. PADIFOLIA (Willd.) T. & G. Queens Co.: wet boggy thickets near Louis Lake, Port Joli. See p. 159.

I. VERTICILLATA, var. TENUIFOLIA (Torr.) Wats. Yarmouth Co.: moist, rocky wooded slope, Tusket. Halifax Co.: cool damp woods, Windsor Junction, *Howe* & *Lang*, no. 415.

** I. VERTICILLATA (L.) Gray, var. **fastigiata** (Bicknell), n. comb. *I. fastigiata* Bicknell, Bull. Torr. Bot. Cl. xxxix. 426 (1912).—Yarmouth Co.: swampy spruce woods and thickets, southwest shore of Trefry's Lake, Arcadia; gravelly thicket by Fanning Lake, Carleton; thicket bordering Great Pubnico Lake (less characteristic form). See p. 109.

I. GLABRA (L.) Gray. Frequent or common, often dominant in spruce woods, bogs and on wet or dry barrens, Digby and Yarmouth Cos. to Halifax Co. See pp. 91, 97, 98, 105, 110, 142. 148, 158, 159, 161.

* Acer rubrum L., var. tridens Wood. Occasional from Yarmouth Co. to Queens Co. See pp. 102, 151.

Rhamnus alnifolia L'Hér. Cumberland Co.: openings in swampy woods, Springhill Junction.

Hypericum boreale (Britton) Bicknell. Common throughout the province.

** H. dissimulatum Bicknell, Bull. Torr. Bot. Cl. xl. 610 (1913). Yarmouth Co.: boggy swale, Tusket Falls; wet moss, Argyle Head. Halifax Co.: gravelly beach of Third Lake, Windsor Junction. See p. 149.

** Elatine minima (Nutt.) Fisch. & Meyer; Fernald, Rhodora, xix. 13 (1917). Shallow water at sandy, muddy or gravelly margins of lakes, common in Digby, Yarmouth and Shelburne Cos. In the tidal mud of the Tusket, fruiting when only 2–3 mm. high.

Although here recorded for the first time in Canada, *E. minima* was collected by *Fernald, Long* & *St. John* (no. 7765) in 1912 in Lake Verde, Prince Edward Island.

Lechea intermedia Leggett. Common in dry open soil in most silicious regions. See p. 138.

Viola cucullata Ait., forma prionosepala (Greene) Brainerd, Rhodora, xv. 112 (1913). Commoner than the glabrous form in Yarmouth Co.

* V. cucullata, var. microtitis Brainerd, l. c. Digby Co.:

mixed woods, Hectanooga. YARMOUTH Co.: wet thickets and woods, Yarmouth.

V. SEPTENTRIONALIS Greene. Common throughout the province.

V. FIMBRIATULA Sm. Dry open soil, Yarmouth Co. to Annapolis and Halifax Cos. See p. 138.

V. PRIMULIFOLIA L. Damp sand, gravel and peat, Yarmouth and Shelburne Cos. See p. 150.

V. INCOGNITA Brainerd. Common in wet woods and thickets.

V. INCOGNITA, var. FORBESII Brainerd, Bull. Torr. Bot. Cl. xxxviii. 8 (1911). Common, usually in drier or upland woods.

V. RENIFOLIA, var. BRAINERDII (Greene) Fernald, RHODORA, xiv. 88 (1912). Rich or calcareous woods from Annapolis Co. to Cape Breton.

V. ERIOCARPA Schwein., var. **leiocarpa** Fernald & Wiegand, n. var., ovariis capsulisque glabris.

Ovaries and capsules glabrous.—Eastern Quebec to Minnesota, south to North Carolina, Tennessee, Missouri and Kansas. TYPE: Breezy Point, Warren, New Hampshire, July 21, 1907, *E. F. Williams* in Gray Herb.

In Britton & Brown's *Illustrated Flora*, ed. 2, ii. 559, Brainerd takes up the name *Viola eriocarpa* Schwein. as the earliest specific name for the plant he had formerly called *V. scabriuscula* Schwein. and describes it as having "capsule ovoid, woolly or sometimes glabrous." This description of the fruit is certainly in accord with the specific name but it is doubtful if most botanists of the northernmost states and adjacent Canada would recognize it as applying to the common yellow violet of rich woods, which they have been accustomed to call *V. scabriuscula*. In the Maritime Provinces, Quebec, New England and New York the authors have never seen *V. eriocarpa* except with glabrous ovary and capsule; but a single specimen in the herbarium of the New England Botanical Club from Hartford County, Connecticut (Tariffville, *Winslow & Hill*) shows that the plant with woolly capsule rarely occurs in the Northeast. We have examined 154 sheets of the species in which the ovary or capsule is displayed. In 12 sheets (1 from Connecticut, 2 from the same station in Maryland, 1 from southern Ontario, 2 from Indiana, 1 from Illinois, 1 from Minnesota, 1 from Kansas, and 3 from Oklahoma) the ovary or capsule is woolly; in 2 sheets (1 from Indiana, 1 from Wisconsin) some plants have woolly, some glabrous capsules; while 140 sheets (6 from Quebec, 2 from New Brunswick, 1 from Nova Scotia, 24 from Maine, 21 from New Hampshire, 14 from Vermont, 27 from Massachusetts, 1 from Rhode Island, 8 from Con-

necticut, 5 from New York, 9 from Pennsylvania, 2 from the District of Columbia, 1 from West Virginia, 1 from Virginia, 1 from North Carolina, 1 from Indiana, 2 from Tennessee, 2 from Michigan, 1 from Wisconsin, 3 from Illinois, 1 from Minnesota, 1 from Iowa, 5 from Missouri, and 1 from Kansas) have the ovary or capsule strictly glabrous. Mr. Walter Deane informs us that in his extensive herbarium there is only one sheet of *V. eriocarpa* (and that a number from Oklahoma already checked in the Gray Herbarium) with pubescent capsules. It is thus apparent that the more widely dispersed plant has glabrous capsules and, extending far to the northeast of the nomenclatorially typical *V. eriocarpa*, is worthy varietal separation.[1]

Rather local in Nova Scotia; probably confined to the calcareous districts. Hants Co.: alluvial woods along Five-Mile River. Nichols's report of *V. canadensis* (Veg. No. Cape Breton, 283) as characterizing the climax forest of Cape Breton was based on *V. eriocarpa*, var. *leiocarpa*.

V. conspersa Reichenb. Occasional from Digby Neck to Cape Breton.

Shepherdia canadensis (L.) Nutt. To the already recorded stations on Cape Breton may be added: rock-faces and crevices of gypsum cliffs, Port Bevis. See pp. 164, 170.

** Decodon verticillatus (L.) Ell., var. laevigatus T. & G.; Fernald, Rhodora, xix. 154 (1917). Shelburne Co.: quaking peaty margin of Clement Pond, Barrington. See p. 150.

Lythrum Salicaria L. Colchester Co.: low ground by railroad, Truro.

* Rhexia virginica L. Yarmouth Co.: wet thicket-margin by Randel Lake, Argyle; sandy shore of Great Pubnico L.; peaty margin of Kegeshook L. See pp. 149, 167, 168.

Epilobium palustre L. Wet thickets and swamps, from Annapolis and Queens Cos. eastward.

E. palustre, var. monticola Haussk. Common throughout, in open bogs and damp peaty barrens.

* E. glandulosum Lehm., var. occidentale (Trel.) Fernald, Rhodora, xx. 35 (1918). Queens Co.: damp dune-thicket, Central Port Mouton, very scarce.

Circaea latifolia Hill; Fernald, Rhodora, xix. 87 (1917). *C. Lutetiana* of American authors, not L. Hants Co.: alluvial woods along Five-Mile River. See pp. 137, 170.

C. canadensis Hill; Fernald, Rhodora, l. c. *C. intermedia* Ehrh. Hants Co.: alluvial woods along Five-Mile River. See pp. 137, 170.

[1] Since the above was written, Mr. C. A. Weatherby has reported to us the typical woolly-podded *V. eriocarpa* from 2 additional stations in Connecticut.

MYRIOPHYLLUM ALTERNIFLORUM DC. COLCHESTER Co.: shallow pool, flood-plain of Salmon River, Truro. See p. 133.

M. EXALBESCENS Fernald, RHODORA, xxi. 120 (1919). Brackish water, Cape Breton: Sydney Mines and Baddeck.

M. VERTICILLATUM L., var. PECTINATUM Wallr. CUMBERLAND Co.: spring-pools south of Amherst. See p. 131.

* M. FARWELLII Morong. DIGBY Co.: muddy cove in Lily Lake, Sandy Cove. See p. 163.

* M. HUMILE (Raf.) Morong. Valley of the Tusket River, YARMOUTH Co.: peaty, sandy and muddy shores, pond-hole near head of St. John Lake, Springhaven, passing in deep water to forma NATANS (DC.) Fernald; tidal flats, Tusket Falls. See p. 105.

M. TENELLUM Bigel. Shallow water at sandy or peaty lake-margins of Yarmouth and Digby Cos. Nichols's record of *M. humile* from Cape Breton belongs here. See pp. 105, 141, 142, 143, 163.

PROSPERPINACA PALUSTRIS L. YARMOUTH Co.: boggy swales and savannahs about Tusket (Vaughan) and Butler's (Gavelton) Lakes. See p. 165.

** × P. INTERMEDIA Mackenzie, Torreya, x. 250 (1910). YARMOUTH Co.: boggy savannah by Butler's (Gavelton) Lake, Gavelton. Here as at several stations in Massachusetts and Rhode Island growing with *P. palustris* and *P. pectinata* and obviously a fertile hybrid of them. See p. 166.

** P. PECTINATA Lam. YARMOUTH Co.: wet savannah bordering Butler's (Gavelton) Lake, Gavelton; boggy savannah bordering St. John Lake, Springhaven; peaty and muddy dried-out pond-hole near head of St. John Lake. See pp. 165, 168.

HIPPURIS VULGARIS L. YARMOUTH Co.: shallow pool, Pembroke Shore. CUMBERLAND Co.: spring-pools south of Amherst.

ARALIA RACEMOSA L. Rich or calcareous wooded slopes, Hants Co. to Cape Breton. See p. 170.

SANICULA MARILANDICA L. HANTS Co.: alluvial woods along Five-Mile River. CUMBERLAND Co.: swampy woods, Springhill Junction.

* S. GREGARIA Bicknell. HANTS Co.: alluvial woods along Five-Mile River. See pp. 137, 170.

HYDROCOTYLE AMERICANA L. Common in Yarmouth Co.

OSMORHIZA CLAYTONI (Michx.) Clarke. Rich, alluvial or calcareous woods, Annapolis Co. to Cape Breton. See p. 170.

O. DIVARICATA Nutt. ANNAPOLIS Co.: brookside in mixed woods, southern slope of North Mountain, north of Middleton. VICTORIA Co.: open woods about bases of gypsum cliffs, Port Bevis. See pp. 140, 170.

Conium maculatum. Waste ground, Digby.

* *Levisticum officinale* (L.) Koch. YARMOUTH Co.: railroad bank, Lake Annis.

** LILAEOPSIS LINEATA (Michx.) Greene. YARMOUTH Co.: rocky and muddy tidal banks of Tusket River, Tusket. See p. 110.

Coelopleurum lucidum (L.) Fernald, Rhodora, xxi. 146 (1919). Apparently common on gravelly or rocky sea-shores. See p. 99.

Cnidium chinense (L.) BSP. Queens Co.: mossy spruce woods near mouth of Broad River. See p. 159.

Cornus rugosa Lam. *C. circinata* L'Hér. See Rehder, Rhodora, xii. 122 (1910). Open woods and talus about gypsum cliffs. Hants Co.: Five-Mile River. Victoria Co.: Port Bevis.

C. stolonifera Michx. Common from Hants Co. eastward.

* C. Amomum Mill. Victoria Co.: thicket along cold brook in woods at head of Baddeck Bay, Baddeck. See p. 164.

C. alternifolia L. f. Common from northern Digby Co. to Cape Breton. Rare in Yarmouth Co.: rocky woods near Eel Lake.

Chimaphila umbellata (L.) Nutt., var. cisatlantica Blake, Rhodora, xix. 241 (1917). Rare and local in the western counties; only scattered sterile plants found.

Pyrola secunda L., var. obtusata Turcz. Digby Co.: sphagnous spruce swamp, Hectanooga. See p. 146.

P. chlorantha Sw.; Fernald, Rhodora, xxii. 51 (1920). Annapolis Co.: mixed woods, southern slope of North Mountain, north of Middleton.

P. chlorantha, var. paucifolia Fernald, Rhodora, l. c. With the last.

** P. rotundifolia L., var. arenaria Mert & Koch; Fernald, Rhodora, xxii. 122 (1920). Infrequent in the silicious areas. Yarmouth Co.: border of dry spruce woods, Belleville. Digby Co.: open pasture, Hectanooga. Annapolis Co.: damp *Polytrichum*-covered sandy plains, Middleton. See pp. 97, 138.

P. rotundifolia L., var. americana (Sweet) Fernald, Rhodora, xxii. 122 (1920). Rare in the western counties; seen only at one station in Yarmouth Co.: wooded knoll in barrens west of Goose Lake, Argyle.

** Rhododendron canadense (L.) Torr., forma viridifolium Fernald in Wilson & Rehder, Mon. Azal. 122 (1921). Yarmouth Co.: a few scattered colonies in boggy thickets bordering Trefry's Lake, Arcadia. See p. 145.

Arctostaphylos Uva-ursi (L.) Spreng., var. coactilis Fernald & Macbride, Rhodora, xvi. 212 (1914). Noted in the western counties only on the silicious areas from Lunenburg Co. to southern Yarmouth Co.

(*To be continued.*)

Vol. 23, no. 273, including pages 201 to 220 and plate 132, was issued 9 January, 1922.

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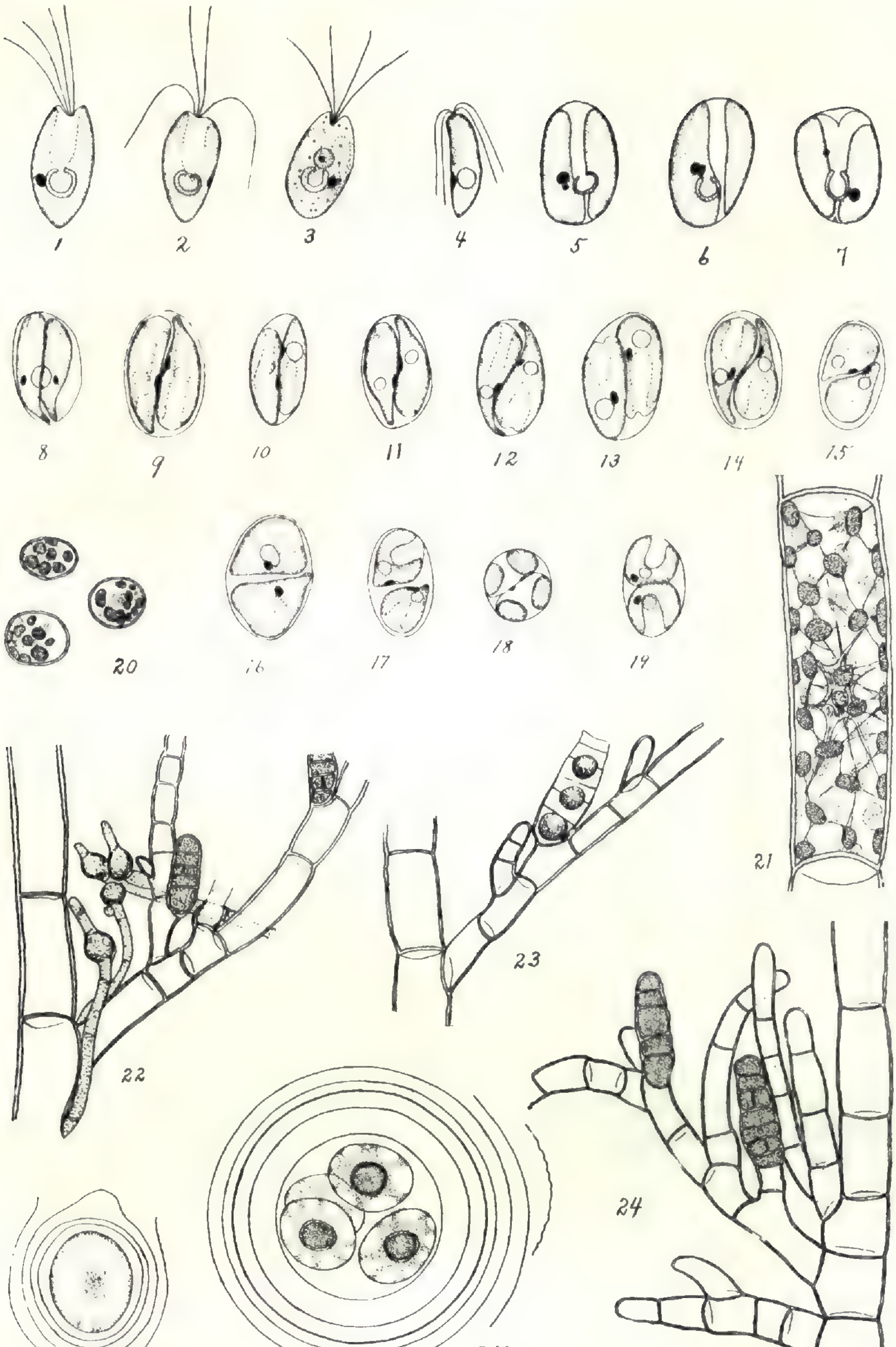

Figs. 1–19. Platymonas subcordiformis.
Figs. 20–24. Ectocarpus Mitchellae var. parva
Figs. 25–26. Asterococcus superbus.

Rhodora

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JOURNAL OF

THE NEW ENGLAND BOTANICAL CLUB

Vol. 23. **December, 1921.** **No. 276.**

NOTES ON NEW ENGLAND HEPATICAE,—XVI.[1]

Alexander W. Evans.

The difficult genus *Scapania* continues to occupy the attention of European students of the Hepaticae, and many new species have been proposed during recent years. Some of these have been accepted without question, others are now regarded as "small" species, while still others have been reduced to synonymy or to varietal rank. In the present paper one of the most distinct of these recently described species, *S. hyperborea*, is recorded from New England for the first time, and it is probable that others will eventually be discovered. The paper records also another species of *Nardia* from New England (making eight in all), lists a series of additions to local state floras and concludes with a revised census of New England Hepaticae.

1. Nardia fossombronioides (Aust.) Lindb. Acta Soc. Sci. Fenn. **10**: 530. 1875. *Jungermannia fossombronioides* Aust. Proc. Acad. Philadelphia for 1869: 220. On moist rocks along the Shepaug River, Washington, Connecticut, August 16, 1921 (*A. W. E.*). New to New England. In 1919 the writer published an illustrated account of this rare species,[2] citing specimens from New Jersey, West Virginia and Illinois. Its discovery in Connecticut extends its known range to the northward, and the following specimens received from Dr. Conklin extend its range to the southward: Winston-Salem, North Carolina, September 5, 1920, *P. O. Schallert 36, 43*. The plants from the Shepaug River grew in situations which are clearly submerged at certain seasons. When fresh the leaves were

[1] Contribution from the Osborn Botanical Laboratory.

[2] Bryologist **22**: 59. *f. 1–7.* 1919.

decidedly crispate, presenting much the appearance of a *Fossombronia*, and the purple rhizoids increased the resemblance. The only accompanying species was *Marchantia polymorpha*, although *Pellia epiphylla* grew in the near vicinity.

2. SCAPANIA HYPERBOREA Jörgensen, Forh. Vidensk.-Selsk. Christiania **1894**[8]: 56. 1894. *S. irrigua* var. *alpina* Bryhn, Nyt Mag. Naturw. **40**: 6. 1902 (in part). *Martinellia hyperborea* Arnell & Jensen, Naturw. Unters. Sarekgebietes **3**: 97. 1907. On rocks above timber line. Mt. Katahdin, Maine, August 27, 1908 (*A. W. E.*); Mt. Lafayette, New Hampshire, July, 1908 (*A. Lorenz*).[1] New to the North American mainland but previously reported from Greenland by C. Jensen.[2]

This interesting species was first described from male plants collected in Norway. It was overlooked by K. Müller, when he published his monograph of *Scapania* in 1905, but was redescribed two years later by Arnell and Jensen, as indicated in the synonymy. They were able to add an account of the female plant and to cite the species from Sweden, as well as from Norway. In 1915 Müller[3] recognized the validity of *S. hyperborea* as a "kleine Art" and published excellent figures of it. He considers it an arctic species but admits the possibility of its being found on the high mountains of Central Europe. Through the kindness of Dr. Arnell, who has devoted much attention to the European and Siberian species of *Scapania*, the writer has been able to study three Scandinavian specimens of *S. hyperborea*, and these agree in all essential respects with the New England specimens listed above.

The plants grow in dense mats, sometimes in admixture with other Hepaticae, and are distinguished by a brown or reddish brown pigmentation. The somewhat rigid leaves are imbricated and the two lobes, in typical cases at least, arch only slightly or not at all across the stem. The keel is relatively long and is straight or somewhat arched, a narrow entire wing being sometimes present. The dorsal lobe tends to be convex but is sometimes reflexed; it is broadly ovate in outline and usually measures 0.8–1 mm. in length by 0.7–0.9 mm. in width. The apex varies from rounded to bluntly pointed, the margin is entire or vaguely sinuate, and there is little or no decurrence

[1] Listed by Miss Lorenz under the name *S. curta*, Bryologist **11**: 114. 1908.
[2] Meddel. om Grönland **43**: 166. 1910.
[3] Rabenhorst's Kryptogamen-Flora **6**^{2}: 415. *f. 121.* 1915.

at the base. The ventral lobe is plane to slightly convex; it has much the same shape as the dorsal lobe but is somewhat larger, measuring (in well-developed leaves) 1.2–1.5 mm. in length by 1–1.2 mm. in width. The apex and margin are like those of the dorsal lobes but the decurrence tends to be somewhat more marked. The median leaf cells of the lobes measure about $20 \times 15\mu$ and are marked by large pigmented trigones, usually with bulging sides and often giving the cell-cavities a more or less stellate outline. The cuticle is smooth or nearly so. The gemmae, first described and figured by Müller, are oval bodies, mostly 15–20μ in length and 10–15μ in width. They occur in dense claret-colored masses and are mostly two-celled, although one-celled gemmae also occur. The lobes of the male bracts are almost equal, and the mouth of the perianth is sparingly toothed; otherwise the sexual plants yield no additional characters of importance.

Jörgensen compared his species with the European *S. crassiretis* Bryhn, but later writers have shown that its true relationship is with *S. irrigua* (Nees) Dumort. and *S. paludicola* Loeske & K. Müll. In both of these species trigones are a characteristic feature of the leaf-cells but are much less conspicuous than in *S. hyperborea*. The species are further distinguished by their yellowish green color, pale gemmae and abruptly pointed leaves, although in *S. irrigua* at least rounded leaves also are of frequent occurrence. The keels of the leaves in *S. irrigua* are much like those of *S. hyperborea*, but those of *S. paludicola* are normally wingless and strongly arched.

Although the distinctions emphasized will usually serve to separate these three species without difficulty, certain European forms have been described which seem to connect *S. hyperborea* with its allies. The most important of these are the following: *S. remota* Kaalaas (1898), *S. irrigua* var. *alpina* Bryhn (1902), and *S. paludicola* var. *Kaalaasi* K. Müll. (1915). Müller regards *S. remota* as a variety of *S. irrigua* and reduces the var. *alpina* to synonymy under it; and he includes under the var. *Kaalaasi* some of the Swedish plants which Arnell and Jensen referred to *S. hyperborea*. In a recent letter from Dr. Arnell he writes that he now regards the var. *alpina* as an aggregate, made up in part of *S. hyperborea* and in part of *S. paludicola; S. remota* he considers an unimportant form of *S. irrigua* and the var. *Kaalaasi* as a scarcely more important form of *S. paludicola*. These divergent views clearly indicate that the plants in question are in

need of further study. In the writer's opinion, however, *S. hyperborea* is as worthy of recognition as certain other species of *Scapania* which are accepted without question.

The additions to local state floras, not already mentioned in the preceding pages, are as follows:—

For Maine: *Lunularia cruciata*, Bar Harbor, Mt. Desert (*A. Lorenz*); *Calypogeia fissa*, Seal Harbor, Mt. Desert (*E. L. Rand*); *C. Sullivantii*, Upper Hadlock Pond, Mt. Desert (*A. Lorenz*); *Cephaloziella bifida*, Mt. Katahdin (*A. Lorenz*); *Radula obconica*, Pemetic Mountain Trail, Mt. Desert (*A. Lorenz*); *Scapania paludosa*, Sunken Heath Brook, Mt. Desert (*E. L. Rand*).

For Vermont: *Fossombronia foveolata*, Grand Isle (*A. Lorenz*); *Cephaloziella bifida*, Lunenberg (*A. Lorenz*); *Nardia obovata*, Smuggler's Notch (*A. Lorenz*)[1]; *Plagiochila Austini*, Brandon (*D. L. Dutton*); *Anthoceros crispulus*, Jerico (*A. W. E.*). The Vermont "+" record for *A. punctatus* (see Rhodora **7**: 58, 1905) was based on this last material; *A. punctatus* should therefore be marked in the list with a "–" sign.

The census of New England Hepaticae now stands as follows: total number of species recorded, 194; number recorded from Maine, 148; from New Hampshire, 153; from Vermont, 134; from Massachusetts, 121; from Rhode Island, 79; from Connecticut, 146; from all six states, 63.

Sheffield Scientific School, Yale University.

THE GRAY HERBARIUM EXPEDITION TO NOVA SCOTIA, 1920.

M. L. Fernald.

(*Continued from p. 278.*)

Gaylussacia dumosa (Andr.) T. & G., var. Bigeloviana Fernald, Rhodora, xiii. 99 (1911). Common in boggy barrens and in sphagnous bogs, Yarmouth Co. to Halifax Co.; Cumberland Co.; and collected by others on Cape Breton. See pp. 99, 132, 148.

[1] The earlier Vermont record for this species was based on *N. obscura* (see Rhodora **21**: 160. 1919).

In Newfoundland, Nova Scotia and New England, where *G. dumosa*, var. *Bigeloviana* is distinctively a shrub of wet bogs and sphagnous pond-margins, it seems specifically distinct from typical *G. dumosa* which occurs from Virginia to the Gulf States, where the species is characteristic of dry barrens. In typical *G. dumosa* the upper surfaces of the leaves and of the bracts of the inflorescences are scarcely if at all glandular, the corolla is 5–7 mm. long and the anthers are 2.8–3.5 mm. long, while in the more northern var. *Bigeloviana* the upper surfaces of leaves and bracts are copiously glandular, the corollas are 8–9 mm. long, and the anthers 4–5 mm. long. In order to test these characters in an intermediate area I have borrowed, through the kindness of Mr. Bayard Long, the material of the Philadelphia Academy, including the remarkable collection of the Philadelphia Botanical Club. A careful study of this extensive collection (about 60 sheets) from New Jersey, Delaware and eastern Pennsylvania shows that, while in a large proportion of cases typical *G. dumosa* and its var. *Bigeloviana* are readily distinguished in New Jersey and the adjacent region, there are too many cases in which the characters break down to allow the elevation of var. *Bigeloviana* to specific rank. Thus material from New Texas, Lancaster Co., Pennsylvania, with the copious glandularity of the northern shrub, has the small corolla (6.5–7 mm. long) and the small anthers (about 3 mm.) of the southern; or material from Speedwell, New Jersey, with almost no glands on the foliage, has the large corolla (8.3 mm. long) and the long anthers (4.7 mm.) of the northern very glandular shrub, while almost glandless material from Manchester, New Jersey, has the longest corolla seen (9 mm.). It is clear, then, that, although very definite from southern New England to Newfoundland, var. *Bigeloviana* in New Jersey and eastern Pennsylvania passes by various transitions into typical *G. dumosa*.

VACCINIUM VACILLANS Kalm. YARMOUTH CO.: upper border of cobble-beach of Butler's (Gavelton) Lake, Gavelton. See p. 166. Recorded with doubt by Lindsay.

* V. CORYMBOSUM L., var. AMOENUM (Ait.) Gray. Boggy thickets, spruce swamps and lake-margins, common in southern Digby and Yarmouth Cos.; the foliage commonly lustrous and glabrous except for being hirsute on the veins beneath, but sometimes strictly glabrous and often as densely pubescent as in *V. atrococcum* and sometimes as small as in *V. pennsylvanicum*. The berries are commonly blue with a bloom but occasionally as black as in *V. atrococcum*. See pp. 97, 98, 109.

V. CORYMBOSUM, var. PALLIDUM (Ait.) Gray. DIGBY Co.: wet woods and thickets, Meteghan; swampy thickets and woods by Little Doueette Lake, Hectanooga. YARMOUTH Co.: boggy thickets bordering Trefry's Lake, Arcadia.

PRIMULA FARINOSA L., var. MACROPODA Fernald. ANNAPOLIS Co.: crests of basalt cliffs by Bay of Fundy, near Margaretville. See p 139.

*SAMOLUS FLORIBUNDUS HBK. YARMOUTH Co.: rocky and muddy tidal banks of Tusket River, extending up-stream to Tusket Falls; brackish muddy and gravelly margin of Eel Lake. See pp. 105, 142.

Lysimachia punctata L. Thoroughly naturalized by roadsides in most parts of the province. See p. 95.

STEIRONEMA CILIATUM (L.) Raf. Seen in the western counties only at one station in YARMOUTH Co.: alder thicket, Yarmouth.

**SABATIA KENNEDYANA Fernald, RHODORA, xviii. 150, t. 121 (1916). YARMOUTH Co.: apparently general in the Tusket Valley, above the lower tidal reaches: peaty margin of Kegeshook Lake; very abundant on boggy savannah bordering St. John L., Springhaven; sandy and gravelly margin of Pearl L., Kemptville; wet pockets in sandy and cobbly beach of Fanning L., Carleton; peaty and gravelly border, northwest side of Tusket (Vaughan) L. (flowering plants wholly submerged by high water); wet savannah bordering Butler's (Gavelton) L., Gavelton. See pp. 158, 160, 165, 167.

Macoun recorded *S. chloroides* Pursh (a southern relative of *S Kennedyana*) as on Sable Island, but St. John states (Proc. Bost. Soc. Nat. Hist. xxxvi. 89) that Macoun's material is *Centaurium umbellatum*.

BARTONIA VIRGINICA (L.) BSP. Common in western Nova Scotia. Our collections are as follows. YARMOUTH Co.: cobbly beaches of East Branch of Tusket and of Butler's Lake, Gavelton; open spot in rocky woods near Eel L.; sandy and peaty bog, Sand Pond, Argyle; dry rocky open thickets near Randel L., Argyle; dryish peaty barrens, Lower Argyle. SHELBURNE Co.: dry rocky or gravelly barrens near Clement Pond, Barrington. QUEENS Co.: dry blueberry barrens near Louis L., Port Joli; openings in dryish thickets, Port Mouton; boggy thickets and border of swale, Central Port Mouton. ANNAPOLIS Co.: damp *Polytrichum*-covered sandy plains, Middleton. Recorded by J. M. Macoun, Ottawa Nat. xxiii. 192 (1910) from Lunenburg Co. See pp. 138, 148, 154, 157, 159.

B. PANICULATA (Michx.) Robinson. As already stated (pp. 149, 153, 156), *B. paniculata*, as it occurs in Nova Scotia, is tremendously variable and clearly passes into plants which closely approach the Newfoundland *B. iodandra*. As a result of prolonged but not wholly

satisfying study the following treatment is proposed as the best I can yet arrive at.

Calyx cleft nearly or quite to base: corolla-lobes lanceolate to narrowly oblong, sharply acuminate or at least acute.
Plant yellowish-green, rarely purplish: inflorescence thyrsoid or a simple raceme: leaves and calyx-lobes firm, subulate to linear-lanceolate, yellowish-green or at most purple-tipped: flowers 2.5–5 mm. long: corolla-lobes mostly creamy-white, lance-acuminate, 0.7–1.5 mm. broad: anthers mostly yellowish.....*B. paniculata* (typical)
Plant purplish or fulvous: inflorescence a simple raceme, rarely subpaniculate: leaves and calyx-lobes fleshy or herbaceous; the latter deeper green to purple, lanceolate to oblong: flowers 3.8–6 mm. long: corolla-lobes often purple-tipped or watery-white, lance-oblong, 1.2–2 mm. broad: anthers mostly purple.....Var. *intermedia.*
Calyx cleft (at least on one side) only two-thirds or three-fourths to base; its lobes herbaceous, oblong to ovate: corolla-lobes petaloid, oblong to narrowly ovate, blunt or merely acutish, 1–2 mm. broad.
Racemes simple or dichotomous: pedicels clavate: 2 or 3 calyx-lobes distinct to base: corolla 3–5 mm. long, creamy-white: anthers mostly yellowish.....Var. *sabulonensis.*
Racemes mostly simple: pedicels filiform: calyx-tube 1–2 mm. long: corolla 4–7 mm. long, often purple-tinged: anthers mostly purple.....Var. *iodandra.*

** B. PANICULATA (typical). Wet bogs, sphagnous quagmires, peaty and wet cobbly shores. YARMOUTH CO.: Jassy Lake, Lake Annis; Pembroke Shore; Porcupine L. and Trefry's L., Arcadia; Butler's (Gavelton) L., Gavelton; Sand Pond, Randel L. and Goose L., Argyle; wet barrens, Lower Argyle; St. John L., Springhaven. QUEENS CO.: near Louis L., Port Joli; near mouth of Broad River.

** B. PANICULATA, var. **intermedia**, n. var., plantis purpurascentibus vel fulvescentibus; racemis simplicibus laxis, pedicellis elongatis; foliis calycibusque herbaceis fulvo-viridibus vel purpurascentibus; lobis calycis distinctis lanceolatis vel oblongis; floribus 3.8–6 mm. longis; lobis corollae ochroleucis purpureo-tinctis vel translucentibus lanceolato-oblongis 1.2–2 mm. latis; antheris purpurascentibus. Widely distributed in Nova Scotia. RICHMOND CO.: L'Ardoise, August, 1892, *Walter Faxon*. DIGBY CO.: wet peaty hollows in savannahs along Little River, Tiddville, August 22, 1920, *Fernald & Long*, no. 22,299 (TYPE in Gray Herb.). YARMOUTH CO.: boggy wood-road, Pembroke Shore, October 6, *Fernald & Linder*, no. 22,973; boggy swale by Tusket River, Tusket Falls, August 20, *Fernald, Bissell, Graves, Long & Linder*, no. 22,298; cobble-beach of Butler's (Gavelton) Lake, Gavelton, September 4, *Fernald, Long & Linder*, no. 22,303; sphagnous bog near Argyle station, August 4, *Long & Linder*, no. 22,285; quagmire-pools in barrens near Goose Lake, Argyle, August 4, *Fernald & White*, no. 22,282; wet peaty sloughs in barrens, Lower Argyle, August 11, *Fernald, Bissell, Graves, Long & Linder*, no. 22,287; boggy roadside, Pubnico, September 6, *Fernald,*

Long & *Linder*, no. 22,306. QUEENS Co.: wet sphagnous spruce bog near Louis Lake, Port Joli, August 17, *Fernald*, *Long* & *Linder*, no. 22,296; springy sphagnous bog in spruce woods near mouth of Broad River, August 16, *Fernald* & *Bissell*, no. 22,292.

Several collections from eastern Massachusetts to New Jersey are closely similar but less fleshy or herbaceous and with the anthers only tending to purplish, or at first reddish then changing to yellow. These seem to be transitional to var. *intermedia* but not so well defined as the Nova Scotian material.

Var. **sabulonensis** (Fernald), n. comb. *B. iodandra*, var. *sabulonensis* Fernald in St. John, Proc. Bost. Soc. Nat. Hist. xxxvi. 89 (1921). The plant of Sable Island is also on the mainland. We have the following collections. YARMOUTH Co.: wet sandy and rocky shore of Lake Annis; wet lower peaty and cobbly beach and sphagnous swales bordering Salmon (Greenville) Lake; boggy swale by Tusket River, Tusket Falls; cobbly margin of East Branch of Tusket, Gavelton (transitional to typical *B. paniculata*); wet sandy shore of Great Pubnico Lake.

Var. **iodandra** (Robinson), n. comb. *B. iodandra* Robinson, Bot. Gaz. xxvi. 47 (1898).—Known only from Newfoundland.

* APOCYNUM MEDIUM Greene. HALIFAX Co.: slaty ledges and cobbly upper beach of Shubenacadie Grand Lake.

A. CANNABINUM L. Gravels along Shubenacadie R. and Five-Mile R. (Hants).

** ASCLEPIAS INCARNATA L., var. **neoscotica**, n. var., caulibus 3–5 dm. altis, glabris vel sparsissime pilosis; foliis 7–11-jugis ovato-oblongis obtusis vel subacutis glabris vel subtus ad nervos sparsissime setulosis, longioribus 4.5–6.5 cm. longis.—NOVA SCOTIA: wet, lower, gravelly beach of Shubenacadie Grand Lake, July 19, 1920, *Fernald* & *Bissell*, no. 22,318 (TYPE in Gray Herb.); gravelly margin, northwest side of Tusket (Vaughan) Lake, August 20, 1920, *Fernald*, *Bissell*, *Graves*, *Long* & *Linder*, no. 22,319.

Differing from *A. incarnata* in its very short and broad leaves; from var. *pulchra* (Ehrh.) Pers. in its few and short, glabrous or glabrate leaves; var. *pulchra* having 11–21 pairs of longer (the longest 0.9–1.8 dm. long) leaves copiously hairy beneath. See pp. 135, 160.

* *Collomia linearis* Nutt. *Gilia linearis* (Nutt.) Gray. Casual by the railroad, Truro; probably adventive from the Baie des Chaleurs region where abundant and seemingly native.

Lappula echinata Gilib. Waste land, railroad yards, etc., apparently frequent, but nowhere abundant.

* *Symphytum asperum* Lepechin; Macbride, RHODORA, xviii. 23 (1916). *S. asperrimum* Donn. YARMOUTH Co.: waste land, Yarmouth.

** MERTENSIA MARITIMA (L.) S. F. Gray, forma **albiflora**, n. f., corollis albidis.

Corollas whitish.—NOVA SCOTIA: gravelly barrier beach, Sand Beach, Yarmouth Co., July 12, 1920, *Fernald* & *Linder*, no. 22,349 (TYPE in Gray Herb.). See p. 102.

VERBENA HASTATA L. Not seen west of Hants Co.

TEUCRIUM CANADENSE L., var. LITTORALE (Bickn.) Fernald. Gravelly coast of YARMOUTH Co.: Rockville; Eel Lake; Argyle. On Sable Island and the eastern coast of New Brunswick and southwestern coast of Prince Edward Island. See p. 142.

Nepeta hederacea (L.) Trevisan. We have two well-marked varieties of *Nepeta hederacea* introduced into North America. Typical *N. hederacea* with the corolla 1.6–2.2 cm. long is apparently rare in eastern Canada. I have seen it from Charlottetown, Prince Edward Island and from a cellarhole at Arcadia, Nova Scotia (*Pease* & *Long*, no. 22,366). The commoner plant of eastern Canada has the corolla 1–1.5 mm. long and its leaves are inclined to be red or reddish. This is

N. hederacea, var. (*parviflora* Benth.) Druce, Brit. Pl. 57 (1908).

Judging from the representation before me the two varieties are not uniformly distributed in northeastern America, the representation of specimens from Newfoundland to New England being as follows. NEWFOUNDLAND: type, 0; var. *parviflora*, 2. QUEBEC: type, 0; var., 1. PRINCE EDWARD ISLAND: type, 1; var., 1. NEW BRUNSWICK: type, 0; var., 2. NOVA SCOTIA: type, 1; var., 6. MAINE: type, 5; var. 11. NEW HAMPSHIRE: type, 3; var., 4. VERMONT: type, 6; var., 2. MASSACHUSETTS: type, 27; var., 18. RHODE ISLAND: type, 0; var., 11. CONNECTICUT: type, 6; var., 2.

Stachys palustris L. Roadside ditches, Sand Beach (Yarmouth) and Barrington and collected by others about various ports eastward.

True *S. palustris* of Europe is clearly only an introduced plant in eastern America, occurring about ports, on waste land, in ditches, etc. from southeastern Newfoundland and Gaspé Co., Quebec to Ottawa, south, chiefly near the coast, to New Jersey. In this introduced plant the calyx bears stipitate glands mixed with the long glandless hairs and the pubescence of the stem is short and appressed on the sides, longer on the angles. The indigenous plant of alluvial thickets, river terraces and other rich soil from the Penobscot Valley in Maine to Ontario and southward is var. *homotricha* Fernald, in which the calyx lacks stipitate glands and the pubescence of the sides of the stem is elongate, often as long as on the angles.

** LYCOPUS UNIFLORUS Michx., forma **flagellaris**, n. f., apicibus caulis ramorumque valde elongatis flagelliformibus deinde radicantibus.

Tips of the stem and branches much elongated, flagelliform, finally rooting.—NOVA SCOTIA: sandy and cobbly margin of Pottle's Lake, North Sydney, August 30, 1920, *Bissell* & *Linder*, no. 22,387 (TYPE in Gray Herb.).

L. UNIFLORUS, var. OVATUS Fernald & St. John, Proc. Bost. Soc. Nat. Hist. XXXVI. 92 (1921). YARMOUTH Co.: upper border of cobble-beach, Salmon (Greenville) Lake. See p. 156.

** *Linaria vulgaris* L., forma **leucantha**, n. f., corollis palato luteo exceptio lacteis.

Corollas, except for the yellow palate, whitish.—NOVA SCOTIA: railroad embankment south of Amherst, July 18, 1920, *Fernald*, no. 22,407 (TYPE in Gray Herb.). See p. 131.

L. minor (L.) Desf. A characteristic railroad weed, Springhill Junction to Elmsdale (Hants); also Sydney Mines. See p. 132.

L. canadensis (L.) Dumont. Seen by us only as a railroad weed.

LIMOSELLA SUBULATA Ives. YARMOUTH Co.: rocky and muddy tidal banks of Tusket River, Tusket. SHELBURNE Co.: damp sand-flats back of beach, Villagedale. CAPE BRETON Co.: brackish shore, Sydney Mines. See pp. 110, 150.

GRATIOLA AUREA Pursh. Gravelly and sandy lake-shores and dryish savannahs, common in Yarmouth and southern Digby Cos. See pp. 102, 157.

Veronica longifolia L. Abundantly naturalized in roadside-thickets about towns, Yarmouth, Digby and Annapolis Cos. See p. 95.

AGALINIS NEOSCOTICA (Greene) Fernald, RHODORA, XXIII. 139 (1921). Common in damp or exsiccated sandy or peaty open soil, Yarmouth, Digby and Annapolis Cos. Nova Scotian records of *Gerardia purpurea* and *G. paupercula* belong here. See pp. 138, 139, 161.

EUPHRASIA PURPUREA Reeks, var. RANDII (Robinson) Fernald & Wiegand, RHODORA, XVII. 188 (1915). Frequent in turfy soil or on borders of thickets near the coast. Often the white-flowered forma ALBIFLORA Fernald & Wiegand, l. c. See pp. 99, 139.

E. CANADENSIS Townsend; Fernald & Wiegand, l. c. 195. YARMOUTH Co.: dry rocky open thickets near Randel Lake, Argyle; exsiccated roadside, Pubnico. SHELBURNE Co.: pastured open woods, Villagedale; recently burned clearing and grassy roadsides, Barrington. See p. 149.

E. AMERICANA Wettst. Common throughout, on roadsides and in sterile fields.

E. stricta Host; Fernald & Wiegand, l. c. 197. SHELBURNE Co.: pastured open woods, Villagedale; grassy roadside, Barrington.

* UTRICULARIA GEMINISCAPA Benj. *U. clandestina* Nutt. Common in bog-pools and peaty quagmires. Our stations are as follows. YARMOUTH Co.: barrens near Goose Lake, Argyle; near head of Abram River; St. John Lake, Springhaven. DIGBY Co.: Tiddville;

Centerville. SHELBURNE Co.: Villagedale; Barrington. VICTORIA Co.: Kidstone Island, Great Bras d'Or Lake. See pp. 142, 161.

* U. MINOR L. In shallow pools or films of water or in lake-margins. YARMOUTH Co.: Beaver Lake; Tusket Falls. DIGBY Co.: Little River, Tiddville. HANTS Co.: Five-Mile River. HALIFAX Co.: Shubenacadie Grand Lake.

* U. GIBBA L. YARMOUTH Co.: shallow margin and small pools in beach of Jassy Lake, Lake Annis. See p. 143.

U. INTERMEDIA Hayne. Apparently common, but rarely flowering. See p. 141.

* U. PURPUREA Walt. DIGBY Co.: quiet pools in Little River and pond-holes in savannah east of Tiddville. YARMOUTH Co.: deep water of Trefry's Lake, Arcadia; Butler's (Gavelton) L., Gavelton; Kegeshook L. See pp. 145, 161.

* U. RESUPINATA B. D. Greene. DIGBY Co.: muddy margin of Midway (Centerville) Lake, Centerville. See p. 163.

** U. SUBULATA L. Characteristic of wet sandy and peaty lake-margins of Yarmouth and southern Digby Cos. Our stations are as follows: Cedar Lake; Beaver L.; Jassy L., Lake Annis; Salmon (Greenville) L.; Trefry's L., Arcadia; Butler's (Gavelton) L., Gavelton; Clearwater L., Belleville; Randel L. and Sand Pond, Argyle; Great Pubnico L. Always growing with and clearly passing into

** U. SUBULATA L., forma **cleistogama** (Gray), n. comb. *U. subulata*, var. *cleistogama* Gray, Syn. Fl. N. A. ii. pt. 1. 317 (1878). *U. cleistogama* (Gray) Britton, Trans. N. Y. Acad. Sci. ix. 12 (1889). *Setiscapella cleistogama* (Gray) Barnhart in Britton & Brown, Ill. Fl. ed. 2, iii. 231 (1913). See pp. 100, 108, 142, 143, 169.

GALIUM TRIFIDUM L. Springy and boggy spots, locally throughout, much less common than G. CLAYTONI Michx. and G. PALUSTRE L.

* G. TRIFIDUM, var. HALOPHILUM Fernald & Wiegand, RHODORA, xii. 78 (1910). Brackish shores and borders of salt marshes. YARMOUTH Co.: Chebogue. VICTORIA Co.: Kidstone Island. CAPE BRETON Co.: Sydney Mines. See p. 105.

* G. TINCTORIUM L. YARMOUTH Co.: thickets and swales bordering Salmon (Greenville) Lake; boggy swale by Tusket River, Tusket Falls. See p. 104.

Earlier records of *G. tinctorium* from Nova Scotia seem to belong to the common G. PALUSTRE L.

** *Lonicera Periclymenum* L. The European Woodbine, one of the glories of Yarmouth arbors, is becoming naturalized in roadside fence-rows.

VIBURNUM ALNIFOLIUM Marsh. Not seen south of Digby Neck. See pp. 134, 136.

V. OPULUS L., var. AMERICANUM (Mill.) Ait. Occasional from Cumberland and Hants Counties to Cape Breton. See p. 137.

Valeriana officinalis L. Occasional escape to roadsides.

** Eupatorium verticillatum Lam. acc. to Wiegand, Rhodora, xxii. 62 (1920) = E. purpureum L. acc. to Mackenzie, ibid. 165 (1920). Yarmouth Co.: cobbly or bushy borders of Salmon (Greenville) Lake; sandy and rocky border of Tusket River, Tusket Falls; gravelly margin of Tusket (Vaughan) Lake; sandy and cobbly beach of Fanning L., Carleton. See p. 147.

I do not undertake to settle which name should be applied to this coastal plain species. The very fact that two such students as Wiegand and Mackenzie, after prolonged and independent study of the literature, should arrive at such different conclusions is sufficient indication that the identity of the Linnean species cannot be finally settled without close comparisons by someone, who thoroughly understands the plants involved, of the various critical specimens in the Old World herbaria.

E. maculatum L. acc. to Wiegand, l. c. 64 (1920) = E. Bruneri Gray, acc. to Mackenzie, l. c. (1920). Rich thickets and swales, Digby Neck to Halifax Co. and Cape Breton.

Solidago latifolia L. Locally in rich woods or on calcareous slopes, Digby Neck to Cape Breton. See pp. 164, 170.

S. bicolor L. Rare or wanting in the southwest; not seen in Shelburne, Yarmouth and southern Digby Cos.

S. uniligulata (DC.) Porter. Abundant on wet or dryish peaty barrens[1]. Macoun's records of *S. uliginosa* and *S. racemosa* ("*S. humilis*") belong here. There are other records of *S. uliginosa* but I have seen no material from Nova Scotia. See p. 157.

S. juncea Ait. Not seen in Queens, Shelburne and Yarmouth Cos.

S. nemoralis Ait. Rare or wanting in the southwest; not seen in Queens and Shelburne Cos., and seen in Yarmouth Co. only at Carleton. Seeming to prefer argillaceous soil.

** S. Elliottii T. & G. Abundant, often dominant, in boggy clearings, swales, damp thickets, spruce and maple swamps and lake shores, Yarmouth Co. eastward at least to Queens. See pp. 144, 151, 157, 169.

* S. rugosa Mill., var. villosa (Pursh) Fernald. Apparently frequent throughout.

Too much of the Nova Scotian material is intermediate between *S. uniligulata* and *S. neglecta* T. & G. In Massachusetts, too, these plants are not specifically separable and it seems that Gray was correct in treating them as varieties of one species. Since, however, *S. uniligulata* antedates *S. neglecta* they should be combined under the former not under the latter name, which was retained by Gray. The varieties of *S. uniligulata* are as follows.

S. uniligulata (DC.) Porter, var. **terrae-novae** (T. & G.), n. comb. *S. Terrae-Novae* T. & G. Fl. N. A. ii. 206 (1842).

Var. **neglecta** (T. & G.), n. comb. *S. neglecta* T. & G. l. c. 213 (1842).

** S. RUGOSA, var. SPHAGNOPHILA Graves. Occasional in spruce swamps and savannahs, Yarmouth and Shelburne Cos. See p. 151.

S. CANADENSIS L. Rare and local in Yarmouth, Shelburne and Queens Cos. Common farther east. See pp. 143, 151.

* S. SEROTINA Ait. VICTORIA Co.: moist thicket near mouth of Bevis Brook, Port Bevis. See p. 170.

S. SEROTINA, var. GIGANTEA (Ait.) Gray. YARMOUTH Co.: gravelly thicket by Fanning Lake, Carleton. ANNAPOLIS Co.: railroad bank, Middleton.

S. GRAMINIFOLIA (L.) Salisb. Sandy or gravelly shores and damp thickets, apparently throughout. Less common than var. NUTTALLII (Greene) Fernald. See p. 157.

** S. TENUIFOLIA Pursh. YARMOUTH Co.: sandy roadside, Sloane Lake, Pleasant Valley. HALIFAX Co.: gravelly beach of Third Lake, Windsor Junction. See p. 160.

** S. TENUIFOLIA, var. **pynocephala**, n. var., caulibus simplicibus vel subsimplicibus superne vix ramosis 3–7 dm. altis; foliis crassis lineari-oblongis vel lineari-lanceolatis obtusis vel acutiusculis vix attenuatis valde adscendentibus nec patentibus nec revolutis, mediis 2–5 cm. longis 2–6 mm. latis; corymbis densissime glomerulatis vel glomerulis segregatis 1–5 cm. diametro; involucris valde glutinosis turbinato-hemisphaericis, bracteis apice viridibus glanduloso-ciliatis; ligulis plerumque oblongis.—Peaty, gravelly or sandy margins of lakes, Yarmouth, Shelburne and Queens Counties, NOVA SCOTIA. The following are characteristic. SHELBURNE Co.: shallow water at sandy and cobbly margin of Clement Pond, Barrington, August 9, 1920, *Fernald, Long* & *Linder*, no. 22,736. YARMOUTH Co.: sandy and peaty margin of Great Pubnico Lake, September 6, *Fernald, Long* & *Linder*, no. 22,746; shallow water at rocky margin of Goose Lake, Argyle, August 4, *Fernald* & *White*, no. 22,735; rocky margin of Randel Lake, Argyle, August 4, *Long* & *Linder*, no. 22,734; wet gravelly margin of Butler's (Gavelton) Lake, Gavelton, September 2, 1920, *Fernald* & *Long*, no. 22,744; cobbly margin of East Branch of Tusket River, Gavelton, September 4, *Fernald, Long* & *Linder*, no. 22,745; sandy and cobbly beach of Fanning L., Carleton, October 7, *Fernald* & *Linder*, no. 22,741; boggy savannah bordering St. John Lake, Springhaven, October 8, *Fernald* & *Linder*, no. 22,742; peaty and cobbly margin of Salmon (Greenville) Lake, July 31, *Fernald* & *White*, no. 22,733; wet lower peaty and cobbly beach of Salmon (Greenville) Lake, August 13, *Fernald, Bissell, Graves, Long* & *Linder*, no. 22,743 (TYPE in Gray Herb.); sandy and peaty beach of Trefry's Lake, Arcadia, July 15, *Fernald* & *Pease*, no. 22,727, July 29, *Fernald* & *Long*, no. 22,732; cobbly margin of Darling Lake, October 6, *Fernald* & *Linder*, no. 22,738.

Differing from typical *S. tenuifolia* in its simple habit; erect, very thick, firm, broad, short and obtuse or merely acutish leaves; its

very compact and small inflorescence; and more glutinous involucre, with often broader bracts, the outer with dark-green summits and glandular-ciliate margins. In typical *S. tenuifolia* the stem is freely branched above, forming a loose corymb up to 4 dm. broad; the leaves linear-attenuate and sharply acute, thin and inclined to become revolute, the primary ones 4–9 cm. long, 1.5–4 mm. broad; the often only slightly glutinous, though sometimes extremely gummy, involucres commonly with slightly narrower bracts with less pronounced green tips and margins only slightly ciliolate; and the rays usually a little narrower. See pp. 143, 144, 170.

Too many collections, however, show direct transitions in all these characters to allow the specific separation of the Nova Scotian plant. The material from Cedar Lake (nos. 22,726, 22,728, 22,729, and 22,739), collected by different parties at remote points on the shore, has all the character of the heads of extreme var. *pycnocephala;* but the leaves, though firm and ascending, are slenderly attenuate, the primary ones 3.5–7 cm. long, and most of the material is freely branching and with loose corymbs. Other collections (that from Darling Lake above cited, and from lakes at Kemptville), though simple or subsimple, have the leaves slenderly attenuate; while a large colony on dry sand at Sloane Lake, near Pleasant Valley (no. 22,748) is very typical *S. tenuifolia.* Farther south, much of the pond-margin and quagmire material from Cape Cod, though with the foliage of typical *S. tenuifolia,* has heads too close to those of var. *pycnocephala;* while the plants of the Saco valley in Maine and New Hampshire, as well as some from Cape Cod, are often simple or subsimple.

** Aster macrophyllus L., var. velutinus Burgess. Frequent from Yarmouth Co. to Queens.

A. radula Ait. One of the commonest plants of boggy barrens, peaty swales and damp thickets.

* A. vimineus Lam. Digby Co.: thickets and steep wooded banks of Sissiboo River, Weymouth.

* A. vimineus, var. saxatilis Fernald. Yarmouth Co.: gravelly margin of Tusket (Vaughan) Lake; cobble-beach of Butler's (Gavelton) L., Gavelton; boggy savannah bordering St. John L., Springhaven. Digby Co.: sandy beach of Lily L., Sandy Cove.

A. junceus Ait. Yarmouth Co.: wet savannah bordering Butler's (Gavelton) Lake, Gavelton.

A. longifolius Lam. Frequent on shores of lakes and streams.

* A. foliaceus Lindl.; Fernald, Rhodora, xvii. 13 (1915). At scattered stations in Yarmouth and Digby Cos. Flowering earlier

than *A. longifolius* and *A. novi-belgii*, our flowering material collected July 6–25.

A. NEMORALIS Ait. Dominant on peaty barrens, bogs and lake-margins, Digby and Yarmouth Cos. to southern Guysborough Co. and Cape Breton. See p. 90.

A. NEMORALIS, var. MAJOR Peck, N. Y. State Mus. Rep. xlvii. 155—reprint, 29 (1894). Var. *Blakei* Porter, Bull. Torr. Bot. Cl. xxi. 311 (July 20, 1894). See p. 156. Frequent in wet woods, thickets and moist clearings, of similar range to the last.

On p. 156 I gave the date of publication of var. *major* as Jan., 1894. Dr. H. D. House has since informed me that the date of publication is very uncertain. "The State Printer records indicate that the report was received for printing March 1st . . . it is extremely unlikely that the printing was accomplished before July 1st."

ERIGERON HYSSOPIFOLIUS Michx. Crevices and talus of gypsum-cliffs, Five-mile River (Hants) and Port Bevis (Victoria). See pp. 64, 136, 170.

* E. PHILADELPHICUS L. DIGBY Co.: damp roadside, Hectanooga.

ANTENNARIA PETALOIDEA Fernald, var. SUBCORYMBOSA Fernald RHODORA, xvi. 133 (1914). YARMOUTH Co.: dry gravelly railroad embankment, Arcadia. ANNAPOLIS Co.: dry sandy thickets and borders of woods, Middleton. HANTS Co.: dry open gravelly banks of Five-mile River. COLCHESTER Co.: seepy slope, Truro.[1] See p. 103.

[1] A close ally of *A. petaloidea* which demands recognition is

ANTENNARIA **appendiculata,** n. sp. Planta laxe humifusa, stolonibus flagelliformibus ad 1 dm. elongatis apice foliatis; foliis basilaribus spathulato-obovatis 1.5–3 cm. longis 0.5–1.1 cm. latis, supra laxe canescento-tomentosis 1-nerviis; caule florifero 1.5–2.5 dm. alto albido-tomentoso; foliis caulinis 6–9 apice appendiculatis, appendicula scariosa plana colorata 3.5–5 mm. longa; capitulis femineis 1–6 corymbosis; involucro 8–11 mm. alto; bracteis 3–4-seriatis, exterioribus 4–6 mm. longis oblongis obtusis vel subtruncatis plus minusve fulvo- vel purpureo-maculatis, interioribus lanceolato-attenuatis gilvis paulo fimbriatis; corollis 5.3–5.6 mm. longis; stylo flavescente ramibus 0.5 mm. longis; achaeniis 1.2 mm. longis papillosis; setis pappi longioribus 7–8 mm. longis; planta mascula ignota.

Plant loosely humifuse; the stolons flagelliform, up to 1 dm. long, leafy at tip: rosette-leaves spatulate-obovate, 1.5–3 cm. long, 0.5–1.1 cm. wide, loosely canescent-tomentose above, 1-nerved: flowering stem 1.5–2.5 dm. high: cauline leaves 6–9, terminated by a flat scarious colored appendage 3.5–5 mm. long: pistillate heads 1–6, corymbose: involucre 8–11 mm. high: bracts 3–4-seriate; the outer 4–6 mm. long, oblong, obtuse or subtruncate, more or less brown- or purple-blotched; inner lance-attenuate, creamy, a little fimbriate: corollas 5.3–5.6 mm. long; style yellowish, its branches 0.5 mm. long: achenes 1.2 mm. long, papillose: longer pappus-bristles 7–8 mm. long: staminate plant unknown. QUEBEC: dry wooded knolls, banks of the Grand River, Gaspé Co., June 30–July 3, 1904, *Fernald*, distributed as *A. petaloidea* (TYPE in Gray Herb.).

Quickly distinguished from the more southern and western *A. petaloidea* by the flat scarious appendages which terminate most of the cauline leaves.

A. CANADENSIS Greene. Apparently frequent throughout.

A. NEODIOICA Greene. Common.

** A. NEODIOICA, var. GRANDIS Fernald. YARMOUTH Co.: damp rocky barren north of Tusket (Vaughan) Lake. DIGBY Co.: dryish gravelly bank, Meteghan; dry open bank near Little River, east of Tiddville. HANTS Co.: spruce woods along Five-mile River. See p. 98.

** A. NEODIOICA, var. **chlorophylla**, n. var., a forma typica recedit *A. petaloidea* throughout its range has the middle and upper cauline leaves tipped by a firm subulate-aristate appendage, only the very uppermost or bracteal with the appendage flattened; and when well developed it is taller and with full corymbs of 5–15 heads.

Typical *A. petaloidea*, which occurs from Rimouski Co., Quebec, westward and southward, has the basal leaves spatulate to spatulate-obovate and rounded at apex; the cauline leaves at regularly decreasing intervals up to the inflorescence; and the branches of the corymb or the pedicels mostly 0.1–3 cm. long. Var. *subcorymbosa*, which occurs from eastern Newfoundland, and Prince Edward Island to southeastern Maine and Nantucket, has the basal leaves oblanceolate and acute or acutish; the flowering stem nearly or quite without leaves for a distance of 0.7–1.7 dm. below the inflorescence and the branches of the corymb or the pedicels elongate (the lower often 0.5–1.7 dm. long). Professor Wiegand has called my attention to a characteristic plant of west-central New York which has the basal leaves of var. *subcorymbosa* but the short flowering-stem and more approximate cauline leaves of typical *A. petaloidea*. This plant is so characteristic of much of New York state that it may be called

A. PETALOIDEA, var. **noveboracensis,** n. var., foliis basilaribus oblanceolatis vel anguste obovatis acutis 1.5–4 cm. longis 0.5–1.2 cm. latis; caule florifero 0.4–2.3 dm. alto regulariter foliato; corymbo subconferto, ramibus pedicellisque brevibus; bracteis involucri petaloideis.

Basal leaves oblanceolate or narrowly obovate, acute, 1.5–4 cm. long, 0.5–1.2 cm. broad: flowering stem 0.4–2.3 dm. high, regularly leafy: corymb rather crowded; its branches and pedicels short: involucral bracts petaloid. —NEW YORK: along Beaver Brook, south of McLean, Dryden, May 17, 1918, *Eames & Wiegand*, no. 10,953; dry gravelly knolls around Malloryville bog, Dryden, May 16, 1919, *Eames;* dry bank along railroad northeast of Freeville, May 16, 1919, *Eames;* upper Cascadilla Creek, May 20, 1919, *Eames;* dry pasture, Caroline, May 18, 1918, *Eames*, no. 10,951; gravelly fields, Caroline, May 20, 1918, *Eames*, nos. 10,946 and 10,950; dry fields, east of North Pinnacle, Caroline, May 8, 1919, *Eames;* field northeast of Fir-tree Swamp, Danby, May 18, 1918, *Eames*, nos. 10,952 and 10,954; Buttermilk Creek, May 13, 1919, *Eames;* pasture, east side of Michigan Hollow Swamp, Danby, May 30, 1919, *Wiegand;* dry fields near Key Hill Swamp, Newfield, May 21, 1919, *Eames & Wiegand* (TYPE in Gray Herb.); sterile hill near Kennedy Pond, Mendon, June 2, 1917, *Eames & Metcalf*, no. 8936.

On account of its narrow leaves and rather dense corymb var. *noveboracensis* is likely to be confused with undeveloped *A. neglecta*, but in that species the upper cauline leaves instead of having firm subulate-aristate tips, bear thin scarious though often involute appendages.

foliis basilaribus anguste obovatis vel spathulato-oblanceolatis supra glabris viridibus lucidis.

Differing from the typical form of the species in having the basal leaves narrowly obovate or spatulate-oblanceolate, glabrous, green and shining above.—Prince Edward Island and Nova Scotia to New York. PRINCE EDWARD ISLAND: open woods, Brackley Point, June 30, 1888, *J. Macoun*, no. 11,285; dry banks and open woods, O'Leary, July 3, 1914, *Fernald & St. John*, no. 11,199; dry sandy soil, Morell, June 29, 1914, *Fernald* & *St. John*, no. 11,198. NOVA SCOTIA: pasture-fields, Yarmouth, May 28, 1910, *J. Macoun*, no. 80,745; moist mixed woods and thickets, Meteghan, July 7, 1920, *Fernald* & *Long*, no. 22,832. MAINE: gravelly bank, Orono, June 4, 1898, *Fernald*, no. 2364 (TYPE in Gray Herb.); slate ledges, Leadbetter Falls, Township iv, Range 18, Somerset Co., July 6, 1917, *St. John* & *Nichols*, no. 2500; dry bank, Perry, July 9, 1909, *Fernald*, no. 2247; dry rocky banks, Cutler, July 4, 1902, *Kennedy, Williams, Collins* & *Fernald;* roadside north of Town Hill, Mt. Desert Island, July 3, 1897, *Rand;* Somesville, July 7, 1897, *Rand;* dry field, Bristol, May 26, 1898, *Chamberlain*, no. 565; North Berwick, May 30, 1899, *Parlin*, no. 1150. VERMONT: roadside, Willoughby, June 9, 1898, *Williams;* Proctor lot, Rutland, June 6, 1899, *Eggleston;* Bald Mt., Shrewsbury, June 6, 1899, *Eggleston.* MASSACHUSETTS: grassy bank, Leicester, May 30, 1912, *Hunnewell* & *Wiegand;* shaded roadside, Southbridge, May 25, 1900, *Harper;* Orange, May 11, 1912, *Fernald, Hunnewell* & *Wiegand;* rocks, Whatley Glen, Whatley, May 17, 1913, *Harger* & *Fernald;* old pasture, Chester, May 17, 1913, *Weatherby* & *Bean;* wet ground, Savoy, May 31, 1901, *Hoffmann;* rocky open bank, Sheffield, May 30, 1919, *Bean* & *Fernald.* RHODE ISLAND: sheltered roadside banks and grassy clearings bordering thickets near Nayatt, Barrington, May 30, 1911, *Fernald.* CONNECTICUT: bank, Burnside, May 3, 1903, *Weatherby.* NEW YORK: along roadside, high on the bluffs of West Canada Creek, East Herkimer, June 4, 1904, *Haberer*, no. 3079; in shade of arbor vitae, border of Hidden Lake, Litchfield, June 15, 1902, *Haberer*, no. 1717; hillside slopes in shade of arbor vitae, border of Cedar Lake, Litchfield, June 15, 1902, *Haberer*, no. 1718; sandy knolls, Deerfield, May 16, 1910, *Haberer*, no. 2014, in part.

On account of the bright green upper surfaces of the basal leaves confused with *A. canadensis* Greene, under which name most specimens have been distributed. Var. *chlorophylla*, however, has the heads of *A. neodioica* and its cauline leaves are clearly of that species. In *A. canadensis* the upper cauline leaves are terminated by an elongate usually twisted thin scarious appendage; in *A. neodioica* and all its varieties the upper cauline leaves are merely subulate-tipped or mucronate. Macoun's no. 11,285 from Prince Edward Island was

cited by Greene as part of his *A. canadensis*, but the remaining specimens cited by him, including the first (from Lake Mistassini) are alike in having the characteristic flag-like appendage of the upper leaves and the longer and paler involucre so typical of *A. canadensis*.

Gnaphalium sylvaticum L. Woodland paths, roadsides and pastured woods, perhaps introduced, Baddeck, Port Bevis and George River. See p. 164.

* *Ambrosia trifida* L. Railroad gravel, Sydney Mines.

* *Rudbeckia laciniata* L. Escaped from cultivation to roadside thicket, Barrington.

** Coreopsis rosea Nutt. Sandy, gravelly or peaty beaches and margins of the Tusket system, Yarmouth Co.: Tusket (Vaughan) Lake; Butler's (Gavelton) Lake and East Branch of Tusket, Gavelton. See p. 160.

Bidens cernua L. We saw no evidence of this generally common species in the western counties of Nova Scotia.

B. connata Muhl., var. petiolata (Nutt.) Farwell; Fernald, Rhodora, x. 200 (1908). Yarmouth Co.: boggy swale, Quinan.

** B. connata Muhl., var. **inundata**, n. var., foliis primariis inferioribus lobatis, lobis 2–4 basilaribus divergentibus decurrentibus, lobo terminali foliisque superioribus lanceolato-attenuatis anguste serratis vel incisis, petiolis gracilibus vix marginatis: achaeniis exterioribus 5.5 mm. longis, interioribus 7–8 mm. longis aristis marginalibus 3–3.5 mm. longis.

Lower primary leaves lobed; the 2–4 basal lobes divergent and decurrent; the terminal lobe and the upper leaves lance-attenuate, slenderly serrate or incised; the petioles slender, scarcely margined: outer achenes 5.5 mm. long; the inner 7–8 mm. long, with marginal awns 3–3.5 mm. long.—Nova Scotia: wettest portion of a springy sphagnous bog, Sand Beach, September 7, 1920, *Fernald, Long & Linder*, nos. 22,869, 22,870, October 6, 1920, *Fernald & Linder*, no. 22,871 (type in Gray Herb.); sandy brooksides and springy ditches, Baddeck, August 27, 1920, *Fernald & Long*, no. 22,866; about pools at bases of gypsum cliffs, Port Bevis, August 27, 1920, *Fernald & Long*, no. 22,867.

Closely simulating var. *gracilipes* Fernald, Rhodora, xxi. 103 (1919) of the Cape Cod quagmires but with much larger achenes; var. *gracilipes* having the outer achenes 3–4 mm. long, the inner 4.5–5 mm. long and with awns only 2–2.5 mm. long. See p. 167.

* *Matricaria suaveolens* (Pursh) Buchenau. A common roadside weed wherever we went.

* *Artemisia Stelleriana* Bess. Shelburne Co.: upper border of gravelly strand, Villagedale.

Petasites palmatus (Ait.) Gray. Cumberland Co.: swampy woods and thickets, Springhill Junction. See p. 132.

Senecio sylvaticus L. Thoroughly naturalized, possibly indigenous. One of the characteristic plants of recently burned clearings, borders of woods, or gravelly or rocky shores. Sometimes occurring as a railroad weed but more often found in semi-natural habitats, as on the coast of Maine (see Fernald & Wiegand, RHODORA, xii. 106).

SENECIO PAUPERCULUS Michx., var. **Balsamitae** (Muhl.), n. comb. *S. Balsamitae* Muhl. ex Willd. Sp. Pl. iii. 1998 (1804). *S. aureus*, ε. *Balsamitae* (Muhl.) T. & G. Fl. N. A. ii. 442 (1843), at least as to name-bringing synonym. *S. oboratus*, var. *umbratilis* Greenm. Monogr. Senecio. Teil 1: 24 (1901), in Engl. Bot. Jahrb. xxxii. 20 (1902) and Ann. Mo. Bot. Gard. iii. 115 (1916), at least as to type specimen. *S. gaspensis* Greenm. Ann. Mo. Bot. Gard. iii. 138 (1916).

Typical *Senecio pauperculus*, as shown by Michaux's type specimen and by a photograph of it secured by the writer in 1903, is the northern extreme of the plant with basal leaves 0.3–1 cm. broad; the lower and median cauline very slender, mostly 1–6 mm. wide; the upper very reduced, linear or subulate and mostly entire. This plant is abundant in Labrador and Newfoundland, thence to British Columbia where it passes as *S. flavovirens* Rydb. (such plants as *Lyall*, Lower Frazer River, and *J. M. Macoun*, no. 69,356 from Similkameen River, specimens cited by Greenman as *S. flavovirens*). Greenman distinguishes the two as follows:

"Eastern species.....69. *S. pauperculus.*
Western species.....70. *S. flavovirens*"

but without any morphological characters the two are not satisfactorily separated.

In its typical form *S. pauperculus* occasionally extends southward to northern Maine and northern Michigan, but southward it is chiefly represented by var. *Balsamitae*, in which the basal leaves are larger, mostly 0.8–3 cm. broad; the lower and median cauline larger, the largest 0.6–2.5 cm. broad; and the upper mostly well developed and pinnatifid.

We saw var. *Balsamitae* in Nova Scotia on the faces and talus of gypsum-cliffs at Five-mile River (Hants) and at Port Bevis (Victoria).

* *Arctium nemorosum* Lejeune; Fernald & Wiegand, RHODORA, xii. 45 (1910). Waste ground, Digby and Weymouth.

** *Centaurea nigrescens* Willd. ANNAPOLIS CO.: roadsides and borders of fields, Middleton, growing with the common *C. nigra.*

** *Arnoseris minima* (L.) Dumort. *A. pusilla* Gaertn. YARMOUTH

Co.: gravelly railroad bed near the station, Belleville. See p. 142.

* LACTUCA HIRSUTA Muhl. YARMOUTH Co.: dry rocky clearing northwest of Tusket (Vaughan) Lake.

PRENANTHES ALTISSIMA L. Rich woods, Digby Neck to Cape Breton.

P. ALTISSIMA, forma **hispidula** (Fernald), n. comb. Var. *hispidula* Fernald in Brainerd, Jones & Eggletson, Fl. Vt. 89 (1900). DIGBY Co.: rich moist woods, Sandy Cove.

Hieracium Pilosella L. Too common along the line of the Canadian National eastward.

* *H. pratense* Tausch. Fields and railroad banks, Annapolis and Digby Cos.

H. PANICULATUM L. YARMOUTH Co.: border of mixed woods by Randel Lake, Argyle.

EXPLANATION OF PLATE 130.

Fig. 1. Northeastern Range of *Carex Howei*. 2. Southeastern Range of *Empetrum nigrum*. 3. Range of *Ilex glabra*. 4. Northern Range of *Utricularia subulata*. 5. Range of *Poa costata*. 6. Northeastern Range of *Cystopteris bulbifera*. 7. Range of *Erigeron hyssopifolius*. 8. Range of *Amelanchier canadensis*. 9. Portion of Range of *Carex scabrata*. 10. Eastern Range of *Lilium canadense*. 11. Range of *Schizaea pusilla*. 12. Ranges of *Sabatia decandra* (solid) and *S. Kennedyana* (in ellipse). 13. Northeastern Range of *Polygonum robustius*. 14. Range of *Eleocharis tuberculosa*. 15. Northeastern Range of *Potamogeton pulcher*. 16. Northeastern Range of *Panicum longifolium* (Var. *Tusketense* in ellipse). 17. Range of Genus *Lophiola*.

BARRATT, TORREY AND SCHWEINITZ: A CORRECTION AND A DISCREPANCY.—Mr. C. L. Shear, one of the editors of the recently published correspondence of Schweinitz and Torrey (Mem. Torr. Bot. Club, xvi. no. 3, July, 1921) has called my attention to a discrepancy between a statement in my paper on Joseph Barratt (RHODORA xxiii. 123) and one of Torrey's letters. I said that Barratt, in company with Torrey, visited Schweinitz at Bethlehem in the autumn of 1825. There is not only no mention of such a visit in the correspondence, but in a letter dated "December—1825," Torrey writes to Schweinitz, "I am greatly rejoiced to hear, through our friend Mr. Halsey, of your safe return after so tedious an absence." The tedious absence was a trip to Europe which Schweinitz made in the spring and summer of 1825: Torrey could hardly have said in December that he had learned of Schweinitz's return through a third person if he had seen him in the autumn.

Through the kindness of Mr. John H. Sage, I have had the privilege of re-examining Barratt's autobiographical memoranda. These show that that part of my statement placing the meeting with Schweinitz at Bethlehem was based on a misreading of Barratt's rather crabbed manuscript. He wrote, "Saw Mr. Schweinitz of

Bethlehem;" I read it "Saw Mr. Schweinitz at Bethlehem." The meeting, it seems, actually took place at New York early in October, 1825. Barratt was there on his way back to Philipstown after a visit to Middletown. Schweinitz had, no doubt, just reached New York on his return from Europe. They met, Barratt says, at the Moravian Church where "Mr. Schweinitz had been preaching that evening." He adds that "Dr. Torrey was introduced at the same time" and that he (Barratt) "afterwards went up the North River in company with Mr. Schweinitz."

I see no obvious explanation of the contradiction between Barratt's explicit statement that Torrey and Schweinitz met in October, 1825, and the very plain implication of Torrey's letter that they did not. There is, however, nothing to show when Barratt's memoranda were written down: if long after the event, he may have confused two occasions in memory. Schweinitz did go up the North River to visit Torrey at West Point in March, 1827; it is just possible that Barratt was along at that time, though so far as I know, there is no evidence to that effect. Unless we can suppose some such slip of memory on his part, the contradiction must remain, at least for the present, unexplained.—C. A. Weatherby, East Hartford, Connecticut.

Vol. 23, no. 275, including pages 247 to 278 and plate 133, was issued 27 February, 1922.

ERRATA

Additional for vol. 22:
Page 173, line 24, for 91817 read 90,817.
" 197, " 2, for **scientlfic** read **scientific**.

Vol 23:
Page 18, lines 7–8, *for* 'formerly abundant but now very rare' *read* 'now very rare but perhaps destined to become more abundant.'
Page 55, line 23, for *crurisgalli* read *crusgalli.*
No. 269, first page of cover. for 118 read 113.
No. 269, first page of cover, for 113 read 118.
Page 103, line 25, for *A.* read *Amelanchier.*
" 130, " 22, for *A.* read *Amelanchier.*
" 136, " 23, for *retrosa* read *retrorsa.*
" 137, " 6, *for* Mowry *read* Morong.
" 138, " 10, for *Coremia* read *Corema.*
" 139, " 19, *for* diagonistic *read* diagnostic.
" 139, " 31, for *Primila* read *Primula.*
" 146, " 32, for *robustor* read *robustior.*
" 149, " 6, *for* scape *read* scapes.
" 151, " 3, for *Elliotii* read *Elliottii.*
" 152, " 5, for *J.* read *Juncus.*
" 159, " 9, for *Conioselinium* read *Conioselinum.*
" 159, " 12. *for* pronounced *read* pronounced.
" 200, " 21, for 270 read 271.
" 244. " 41, *for* planst *read* plants.

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